DOCUMENT RESUME

ED 467 640 JC 020 577

AUTHOR	Christophersen, Kjell A.; Robison, M. Henry
TITLE	The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon. Volume 1: Main Report [and] Volume 2: Detailed Results [and] Executive Summary.
INSTITUTION	Oregon Dept. of Community Colleges and Workforce Development, Salem.
PUB DATE	2002-03-00
NOTE	85p.
PUB TYPE	Reports - Research (143)
EDRS PRICE	EDRS Price MF01/PC04 Plus Postage.
DESCRIPTORS	*Associate Degrees; *Community Colleges; Diversity (Student); *Economic Impact; Ethnicity; *Outcomes of Education; *Salaries; *Socioeconomic Influences; Tax Allocation; Taxes; Two Year College Students; Two Year Colleges; Wages
IDENTIFIERS	*Oregon Community College System

ABSTRACT

This document presents a 2-volume study and executive summary of the overall economic impacts generated by the Oregon Community College (OCC) system on 17 community colleges in Oregon. Volume 1, or the main report, indicates the OCC system employed 5,945 full- and 8,118 part-time faculty and staff in 2001, amounting to an annual payroll of $285.2 million. The total unduplicated headcount enrollment for all campuses is 392,510. It is estimated that 95% of students remain in the state during the first year, thus generating statewide benefits. Over 30 years, however, 33% of students, and associated benefits, will leave the state. Volume 1 also reports that the average annual earnings for a worker with a high school diploma or GED equivalent are $26,107, compared with $35,616 for a worker with a two-year associate degree. Students and society both benefit from the higher earnings. The economy generates more income, and state and local tax collections are higher as well. Volume 2, or the detailed findings of the study, presents the results of the economic impact analysis in detail by gender, ethnicity, and entry level of education. The study is about the overall economic impacts generated by community colleges (CCs), and as such, the Main Report presents the results without reference to gender and ethnicity differences. The profile data is collected and linked to national statistical databases which are also broken out by gender and ethnic differences. Tables such as, Higher Annual Earnings Based on Achievements During Analysis Year, Aggregate, reveal that white males with an Associate of Arts (AA) degree earn a total of $170,685,037 more than peers without a postsecondary degree, while minority males with an AA degree earn $25,576,682 more. White females with an AA earn $125,638,239 more, while minority females with an AA earn $20,605,465 more. White males with an AA have 36,075 fewer days of absenteeism, minority males 11,722 fewer, white females 51,416 fewer absentee days, and minority females have 23,956 fewer. Total savings to employers due to reduced absenteeism is $14,801,633. Both volumes of this report offer statistics on the reduction in numbers of smokers, numbers of substance abusers, numbers of incarcerated, and numbers on welfare among those with AA degrees compared to those with high school diplomas, no high school diploma, and some college. The executive summary is appended. (NB)

Reproductions supplied by EDRS are the best that can be made
from the original document.

The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon

Volume 1: Main Report [and] Volume 2: Detailed Results [and] Executive Summary

Kjell A. Christophersen and M. Henry Robison

ED 467 640

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

- [] This document has been reproduced as received from the person or organization originating it.
- [] Minor changes have been made to improve reproduction quality.
- [] Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

B. West

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

JC 020 577

The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon

Volume 1: Main Report

14-Mar-2002

Kjell A. Christophersen & M. Henry Robison

CCBenefits Inc.

email: ccb@urlnet.com

Table of Contents

ACKNOWLEDGMENTS ..... **iii**

ACRONYMS ..... **iv**

Preface ..... **v**

Chapter 1 INTRODUCTION **1**

Overview 1

Annual Private and Public Benefits 2

Present Values of Future Benefits 3

Statewide Economic Benefits 4

Chapter 2 DATA SOURCES AND ASSUMPTIONS **5**

Introduction 5

Profile 5

Faculty, Staff, and Operating Budgets *5*

The Students *6*

Entry-Level Education, Gender, and Ethnicity *8*

The Achievements *9*

Annual Private Benefits 11

Annual Public Benefits 12

Higher Earnings *13*

Health Savings *13*

Crime Reduction Benefits *16*

Welfare and Unemployment Reduction Benefits *17*

Costs 18

Opportunity Cost of Time *19*

The Budget *19*

Other Assumptions 20

Statewide Economic Benefits 21

The Impact of OCC Operations *22*

The Direct Economic Development Effects of Students *24*

From Embodied CHEs to Direct Income Effects *25*

The Indirect Economic Development Effects of Students *27*

Chapter 3 PRIVATE, PUBLIC AND STATEWIDE ECONOMIC BENEFITS **29**

Introduction 29

Annual Benefits 29
Higher Student Earnings 29
Social Savings 29
Health-Related Savings 29
Crime-Related Savings 30
Welfare and Unemployment Savings 30
Total Public Benefits 30

Annual Benefits Per CHE and Per Student 31

The Investment Analysis: Incorporating Future Benefits 33
The Student Perspective 35
The Broad Taxpayer Perspective 37
The Narrow Taxpayer Perspective 38
Summary 41

Statewide Economic Benefits 42
OCC Operations 43
Past Student Economic Development Effects 43
Total Economic Benefits 44

Chapter 4 SENSITIVITY ANALYSIS OF KEY VARIABLES 45

Introduction 45

Investment Analysis: The Student Perspective 45
Percent of Students Employed 45
Percent of Earnings Relative to Full Earnings 46

Results 46

Statewide Economic Development 47
The Economic Impact of Student Spending 48
Economic Impacts Reported as Gross Sales 49

REFERENCES 52

Appendix 1: Explaining the Results—a Primer 56

The Net Present Value (NPV) 57

The Internal Rate of Return (IRR) 59

The Benefit/Cost Ratio (B/C) 60

The Payback Period 60

Appendix 2: Methodology for Creating Income Gains by Levels of Education 61

ACKNOWLEDGMENTS

The successful completion of this case study is largely due to excellent support from the staff of the State of Oregon Department of Community Colleges and Workforce Development – Bret West, Al Newnam, and Marilyn Kolodziejczyk. They did a superb job organizing and managing the entire effort in short order. In addition, we are grateful for the work carried out by the institutional research teams at the individual community colleges. Their enthusiasm for the project never wavered and their excellent questions and patience with our sometimes less-than-perfect draft report submissions challenged us to develop a better product in the end. Our special thanks go to Dr. Nicki Harrington, President of Blue Mountain College who first promoted the study and made it all happen. In addition, our own consultant, Steve Peterson contributed invaluable modeling and data collection expertise throughout the study period. Last, but by no means least, we would like to extend our thanks Dr. Ray Taylor of the Association of Community College Trustees (ACCT) whose support through thick and thin has been steadfast. The creation of an economic modeling framework to provide low cost but rigorous economic impact analysis services for community and technical colleges was his vision, one on which he acted some two years ago. Any errors committed in the report belong to the authors and not to any of the above-mentioned institutions or individuals.

CCbenefits Inc. is a company created in collaboration with the Association of Community College Trustees (ACCT) to provide economic analysis services to community and 2-year community colleges. Questions of a technical nature concerning the approach, assumptions, and/or results should be directed to CCbenefits, Inc., c/o Drs Kjell Christophersen and Hank Robison, 121 Sweet Ave., Moscow ID 83843, phone: 208-883-3500, fax: 208-885-3803, e-mail: ccb@turbonet.com.

ACRONYMS

OCC	Oregon's Community Colleges
AD	Associate Degree
ABE	Adult basic education
ACCT	Association of Community College Trustees
B/C	Benefit-cost ratio
CC	Community College
CHE	Credit hour equivalent
ESL	English as a second language
GED	General Equivalency Diploma (also Education Development Certificate)
HS	High school
IO	Input-output analysis
NCF	Net cash flow
NPV	Net present value
REIS	Regional Economic Information System
RR	Rate of return
TC	Technical College
TD	Technical Diploma

Preface

The Association of Community College Trustees (ACCT) contracted with the authors in 1999 to create the model used in this study. The original vision was simple—to make available to colleges a generic and low cost, yet comprehensive, tool that would allow them to estimate the economic benefits accrued by students and taxpayers as a result of the higher education achieved. In short: it only makes economic sense for the students to attend college if their future earnings increase beyond their present investments of time and money; likewise, taxpayers will only agree to fund colleges at the current levels, or increase funding, if the economic benefits exceed the costs.

An important requirement of the ACCT vision was that the model reach far beyond the "standard" study—the computation of the simple multiplier effects stemming from the annual operations of the colleges. Although the standard study was part and parcel of the model ultimately developed, it was only a relatively small part. The current model also accounts for the economic impacts generated by past students who are still applying their skills in the local workforce; and, it accounts for a number of external social benefits such as reduced crime, improved health, and reduced welfare and unemployment, which translate into avoided costs to the taxpayers. All of these benefits are computed for each college and analyzed. To the extent possible, the analysis is based on regional data adjusted to local situations.

Although the written reports generated for each college are similar in text, the results differ. This, however, should not be taken as an indication that some colleges are doing a better job than others in educating the students. Differences among colleges are a reflection of the student profiles, particularly whether or not the students are able to maintain their jobs while attending, and the extent to which state and local taxpayers fund the colleges. Some students give up substantial earnings while attending college because employment opportunities are few and far between. In other cases they are able to work while attending because the area has an abundance of opportunities. That the average student rate of return of 15% for college A is different from the rate of return of 20% for college B, therefore, does not mean that B is doing a better job than A. Rather, it is attributable to the

employment opportunities in the region, and to the fact that one college may cater more to women than to men, or to minorities, and/or to different kinds of students such as transfer vs. workforce vs. retired, etc. In turn, the student body profiles are associated with their own distinct earnings functions reflecting these employment, gender and ethnicity differences. The location of the college, therefore, dictates the profile of the student body, which, to a large extent, translates into the magnitudes of the results. In this sense, it could well be that College A with a 15% student rate of return is actually a better or more efficiently managed school than College B with a 20% student rate of return. The qualitative difference in management efficiency is not equal to the difference between the two returns.

Chapter 1
INTRODUCTION

OVERVIEW

Oregon's community colleges (OCC) generate a wide array of benefits. Students benefit directly from higher personal earnings, and society at large benefits indirectly from cost savings (avoided costs) associated with reduced welfare and unemployment, improved health, and reduced crime. Higher education requires a substantial investment on the part of the student and society as a whole, however. All education stakeholders—taxpayers, legislators, employers, and students—want to know if they are getting their money's worth. In this study, the attractiveness of the returns generated by the 17 community colleges in the state is measured (**Table 1.1** and **Figure 1.1**) relative to alternative public investments. The benefits are presented in three ways: 1) annual benefits, 2) present values of future annual benefits (rates of return and benefit-cost ratios, etc.), and 3) statewide economic benefits.

The study has four chapters and two appendices. **Chapter 1** is an overview of the benefits measured. **Chapter 2** details the major assumptions underlying the analysis. **Chapter 3** presents the main socioeconomic and statewide economic results. Finally, **Chapter 4** presents a sensitivity analysis of some key assumptions—tracking the changes in the results as assumptions are changed. **Appendix 1** is a short primer on the context and meaning of the investment analysis results—the net present values (NPV), rates of return (RR), benefit/cost ratios (B/C), and the payback period. **Appendix 2** explains how the earnings related to higher education data were derived.

Table 1.1. Oregon Participating CC and '99-00 Enrollment

Name of College	Abbreviation	Enrollment
Rogue Community College	RCC	16,461
Southwestern Oregon Community College	Southwestern	15,967
Tillamook Bay Community College	TBCC	3,320
Mt. Hood Community College	MHCC	31,072
Chemeketa Community College	Chemeketa	49,563
Oregon Coast Community College	OCCC	3,567
Columbia Gorge Community College	CGCC	6,630
Blue Mountain CC	BMCC	15,901
Klamath Community College	KCC	5,005
Umpqua Community College	UCC	14,300
Clatsop Community College	CCC	8,398
Portland Community College	PCC	97,222
Clackamas Community College	CCC	28,617
Linn-Benton Community College	LBCC	26,636
Lane Community College	LCC	42,337
Central Oregon Community College	COCC	18,143
Treasure Valley CC	TVCC	9,371
Total		392,510

Figure 1.1. Geographical Distribution of Participating CCs

Note: the map only shows the approximate economic regions that serve as backdrops for the economic impact calculations, they do not reflect the exact district boundaries.

ANNUAL PRIVATE AND PUBLIC BENEFITS

Private benefits are the higher earnings captured by the students; these are well known and well documented in the economics literature. Less well-

known and documented is a collection of public benefits captured by society at large, the indirect benefits, or what economists call *positive externalities*, such as improved health and lifestyle habits, lower crime, and lower incidences of welfare and unemployment. These stem from savings to society from reduced burdens on taxpayer-provided services. We estimate dollar savings (or avoided costs) from reduced arrest, prosecution, jail, and reform expenditures based on published crime statistics arranged by education levels. Likewise, statistics that relate unemployment, welfare, and health habits to education levels are used to measure other savings. The annual economic impacts are presented in three ways: 1) per credit-hour equivalent (CHE), defined as a combination of credit and non-credit attendance[1], 2) per student, and 3) in the aggregate (statewide).

PRESENT VALUES OF FUTURE BENEFITS

The annual impacts continue and accrue into the future and are quantified and counted as part of the economic return of investing in education. This lifetime perspective is summarized as *present values*–a standard approach of projecting benefits into the future and discounting them back to the present. The present value analysis determines the economic feasibility of investing in CC education – i.e., whether the benefits outweigh the costs. The time horizon over which future benefits are measured is the retirement age (65) less the average age of the students.

The present values are also expressed in four ways: 1) net present value (**NPV**) total, per CHE, and per student, 2) rate of return (**RR**) where the results are expressed as a percent return on investment, 3) benefit/cost (**B/C**) ratio – the returns per dollar expended, and 4) the payback period – the number of years needed to fully recover the investments made (see **Appendix 1** for a more detailed explanation of the meaning of these terms).

[1]Instruction hours are not the same as credit hours. CCs prepare people for jobs and are less concerned with (ceremonial) degrees. Many attend for short periods and then leave to accept jobs without graduating. Others simply enroll in non-academic programs. Nonetheless, the CHEs earned will positively impact the students' lifetime earnings and social behavior.

STATEWIDE ECONOMIC BENEFITS

The benefits of a robust economy are many: jobs for the young, increased business revenues, greater availability of public investment funds, and eased tax burdens. In this study we estimate the role of OCC in the statewide economy in terms of its share of total earnings. In general, these CC-linked earnings fall under two categories: 1) earnings generated by the annual operating expenditures of the colleges; and 2) earnings attributable to the CC skills embodied in the workforce.

Chapter 2
DATA SOURCES AND ASSUMPTIONS

INTRODUCTION

To the extent possible, documented statistics are used to estimate model parameters. In the few cases where hard data are scarce, however, the institutional researchers on the scene apply best judgments and estimations on the basis of their intimate knowledge of their colleges and the student bodies.

This chapter contains six assumption sections, all based on various data imbedded in the analytic model: 1) the profiles of the 17 CCs; 2) annual earnings by education levels; 3) the social benefit assumptions (health, crime and welfare/unemployment); 4) education costs; 5) other assumptions (the discount rate used, health, crime, and welfare cost statistics, etc.); and 6) assumptions pertaining to statewide economic effects.

PROFILE

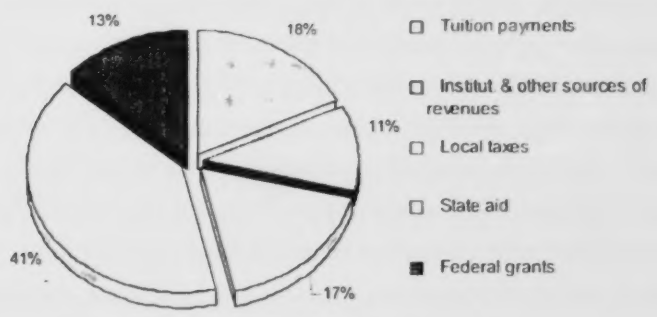
Faculty, Staff, and Operating Budgets

The OCC system employed 5,945 full- and 8,118 part-time faculty and staff in year 2001 amounting to a total annual payroll of some $285.2 million. **Table 2.1** shows the OCC annual revenues by funding source: a total of $583 million. Two main revenue sources—private and public—are indicated. Private sources include tuition and fees (17.9%) plus 11.0% from other private sources (such as contract revenues, interest payments and the like). Public funding is comprised of local taxes (17.4%), state aid (40.2%), and federal grants (13.5%). These budget data are critical in identifying the annual costs of educating the CC student body from the perspectives of the students and the taxpayers alike.

Table 2.1. Aggregate Revenues, the Budget

Sources	Revenues	Total	% of Total
Private Funding			
Tuition payments	$104,299,287		17.9%
Institut. & other sources of revenues	$64,204,068	$168,503,355	11.0%
Public Funding			
Local taxes	$101,469,137		17.4%
State aid	$234,698,722		40.2%
Federal grants	$78,433,572	$414,601,431	13.5%
Total		$583,104,786	100%

Figure 2.1. Revenues: The Budget



The Students

Students attend community colleges for different reasons: to prepare for transfer to four-year institutions, to obtain Associate Degrees or Certificates, obtain basic skills, or perhaps most importantly, to take refresher courses in non-credit programs—workforce students, for example. Students also leave for various reasons; they may have achieved their educational goals or decided to interrupt their college career to work full-time. **Tables 2.2 - 2.4** summarize the student body profiles for the 17 CCs in the state of Oregon. The unduplicated student body (headcount) is 392,510 (FY99-00 enrollment).

Some students forego earnings entirely while attending college while others may hold part- or full-time jobs. Information about student employment plays a role in determining the *opportunity cost* of education incurred by the

students while attending the OCC system[2]. **Table 2.2** rows labeled: "% Employed While Attending" and "% of Full-Time Earning Potential" provide the percentage estimates of the students who held jobs (69%) while attending college, and how much they earned (61%) relative to full-time employment (or what they would statistically be earning if they did not attend college).

Table 2.2. Student Body Profiles

	Values
Total unduplicated enrollment, all campuses	392,510
% of students employed while attending college	69%
% of full-time earning potential	61%
Students remaining in state after leaving college	95%
Attrition rate over time (leaving state)	33%
"Settling In" factors (years):	
Completing Associate Degree	0.5
Completing Certificate	0.5
Non-completing transfer track	2.5
Non-completing workforce	0.0
ABE/ESL/GED	0.5

As indicated in the table, it is estimated that 95% of the students remain in state (as defined in **Figure 1.1**) and thereby generate statewide benefits. The remaining 5% leave the state altogether and are not counted as part of the economic development benefits. The 95% retention rate applies only to the first year, however. We assume that 33% of the students, and associated benefits, will leave the state over the next 30 years due to attrition (e.g., retirement, out-migration, or death).

The last five items in **Table 2.2** are *settling-in* factors – the time needed by students to settle into the careers that will characterize their working lives. These factors are adapted from Norton Grubb (June 1999). Settling-in factors have the effect of delaying the onset of the benefits to the students and to society at large.

[2] The opportunity cost is the measure of the earnings foregone; the earnings the individual would have collected had he or she not attended the OCC.

Entry-Level Education, Gender, and Ethnicity

Table 2.3 shows the education level, gender, and ethnicity of the aggregate OCC student body. This breakdown is used only to add precision to the analysis, not for purposes of comparing between different groups. Five education entry levels are indicated in approximate one-year increments, ranging from less than HS to post AD. These provide the platform upon which the economic benefits are computed.

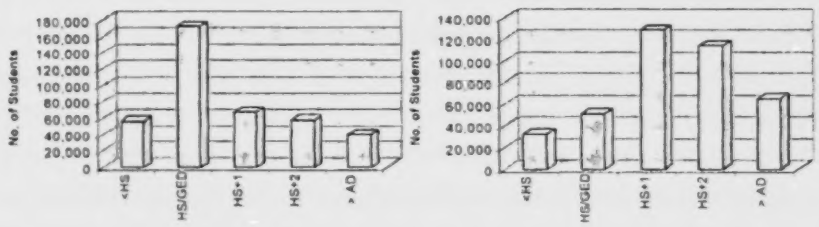
The *entry level* characterizes the education level of the students when they **first** enter the colleges; this is consistent with the way most colleges keep their records. The analysis in this report, however, is based on the educational achievements of the students during the current year. As not all students reported in the enrollment figures for the fiscal year are in their first year of college, an adjustment was made to account for upper class students who had accumulated credits during their community college experience and moved up from the <HS/GED category. For this reason, the education levels of the student body must also be estimated for the beginning of the analysis year. Thus, of the 18,560 white males who **first** entered with less than HS/GED, it is estimated that only 10,828 still remain in that category at the beginning of the analysis year, meaning that 45,771 students have actually moved up from the "<HS/GED" category to the "HS/GED equivalent " category or beyond since they first entered the OCC. Note that the "Entry Level" and "Begin Year" columns always add to the same total. Differences between the two columns reflect a redistribution of students from entry level to where they are at the beginning of the analysis year. The assumptions underlying the process of redistributing the students from the "Entry Level" to "Begin Year" columns are internal to the economic model – they are designed to capture the dynamics of the educational progress as the students move up the educational ladder beyond their initial entry level.

Table 2.3. Education Entry Level of Student Body

	White Male		Minority Male		White Female		Minority Female		Total	
Entry Level	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year
< HS/GED	18,560	10,828	7,477	4,362	22,622	13,197	7,437	4,339	56,096	32,726
HS/GED equivalent	64,329	18,558	11,296	4,200	83,657	23,795	12,428	4,445	171,709	50,999
1 year post HS or less	23,195	47,279	5,853	9,655	30,946	61,229	6,884	10,716	66,879	128,880
2 years post HS or less	20,704	41,176	4,815	9,244	26,554	53,768	5,629	10,595	57,702	114,783
> AD	14,007	22,955	2,325	4,304	20,842	32,632	2,949	5,232	40,123	65,123
Total	140,795	140,795	31,766	31,766	184,623	184,623	35,327	35,327	392,510	392,510

BEST COPY AVAILABLE

Figure 2.2. Student Body Education Level: Entry vs. Beginning of Analysis Year



The Achievements

Table 2.4 shows the student breakdown in terms of analysis year academic pursuits and/or achievements according to four categories: 1) retirees plus those attending (non-reimbursable) hobby and recreation courses, 2) Associate Degree completers, 2) Diploma and Certificate completers, 3) all transfer students, 4) all workforce students, and 5) ABE/ESL students[3].

As indicated in the table, students achieving their graduation goals would be those completing Associate Degrees or Certificates (1.2% and 0.3%, respectively). The majority of students complete college credits, and either fulfill their educational needs, or return the following year to continue to work toward their goals (20.0% + 53.3% = 73.3% in the transfer track and workforce categories, respectively). The retired (12.2%) and ABE/ESL/GED students (13.0%) complete the breakdown of the student body. The retired students are simply backed out of the analysis altogether on the assumption that they do not attend the OCC colleges to acquire skills that will increase their earnings. ABE/ESL/GED students are assumed to have a lower percentage impact than other students, because the end product of their education is to arrive at the "starting gate" on an equal basis with others. This does not mean that ABE/ESL/GED education has lower value, it simply means that these students must complete an extra step before they can compete effectively in the job market and reap the benefits of higher earnings.

[3] ABE/ESL = Adult basic education and English as a second language

BEST COPY AVAILABLE

The third column shows the average age of the students generating the benefits (excluding retirees). The difference between the average age (33.9 years) and retirement at 65, or 31.1 years is the time horizon for the analysis.

As indicated in column four, the average Associate Degree and Certificate student completed 39.0 and 39.9 CHEs of study during the analysis year, respectively. The total number of CHEs completed during the year of analysis for the entire system student body is 3,890,858. Finally, the last column shows the average time the students are actually in residence on campus during the analysis year. This information is needed to determine the opportunity cost of their education.

Table 2.4. Levels of Achievement

Student Body	%	St. Body 392,510	Avg. Age	CHEs This Year	Total Credits	# Years Resid.
Retired + recreation + court req. students	12.2%	47,875	58	3.1	146,923	0.07
Completing AA	1.2%	4,714	31	39.0	183,880	0.87
Completing Certificate	0.3%	1,056	33	39.9	42,124	0.89
Non-completing transfer track	20.0%	78,599	29	17.4	1,370,885	0.39
Non-completing workforce	53.3%	209,232	37	7.4	1,553,960	0.17
ABE/ESL/GED	13.0%	51,078	29	11.6	593,086	0.26
Total or weighted averages	100.0%	392,554	33.9	10.9	3,890,858	
Credits required for one full-time year equivalent of study					45	

Note: weighted average of "CHEs per year does not include the retired students

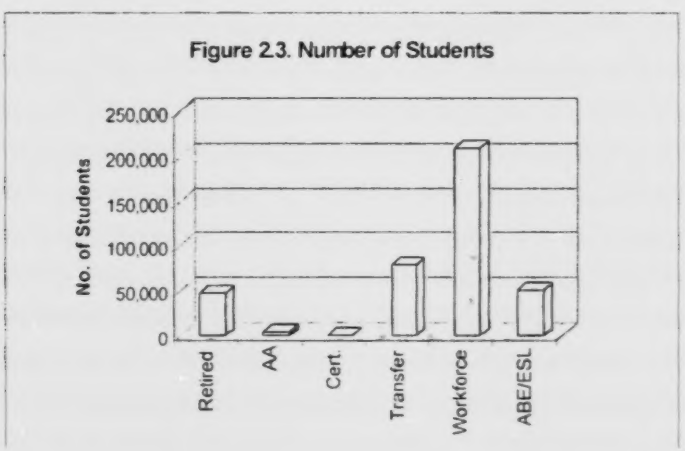
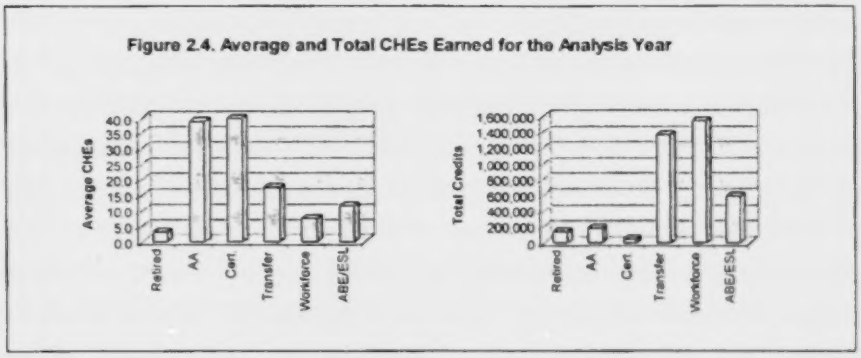


Figure 2.4. Average and Total CHEs Earned for the Analysis Year



ANNUAL PRIVATE BENEFITS

The earnings statistics in **Table 2.5,** on which the benefit estimates (reported in **Chapter 3** below) are based, reflect all occupations (technical and non-technical). The lower the education level, the lower the average earnings, regardless of the subject matters studied. The distinguishing feature among the achievement categories, therefore, is the number of CHEs completed. Statistics indicate that earnings are highly correlated with education. Correlation does not necessarily equal causation, however. Higher education is not the only factor explaining the private and public benefits reported in the statistics. Other variables such as ability, family background, and socioeconomic status play significant roles. The *simple correlation* between higher earnings and education nonetheless defines the *upper limit* of the effect measured. Our estimates of higher education's impact on earnings are based on a survey of recent econometric studies. A literature review by Chris Molitor and Duane Leigh (March, 2001) indicates that the upper limit benefits defined by correlation should be discounted by 10%. Absent any similar research for the social variables (health, crime, and welfare and unemployment), we assume that the same discounting factor applies as well to the public benefits.

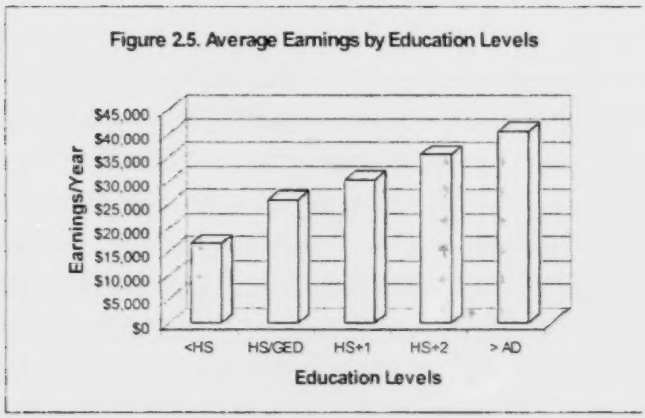
As education milestones are achieved, students move into higher levels of average earnings. **Table 2.5** shows average earnings by one-year education increments, linked to the gender and ethnicity profile of the OCC student body. The differences between the steps are indicated in the last column. We

BEST COPY AVAILABLE

also assume that *all* education has value, and thereby attribute value to students completing less than full steps as well. Specific detail on **Table 2.5** data sources and estimating procedures are found in **Appendix 2: Methodology for Creating Income Gains by Levels of Education by Gender and Race.**

Table 2.5. Weighted Average Earnings

Entry Level	Average Earnings	Diff.
1 short of HS/GED	$16,751	NA
HS/GED equivalent	$26,107	$9,355
1-year Certificate	$30,288	$4,182
2-year Associate Degree	$35,616	$5,327
1 year post Associate Degree	$40,555	$4,939



ANNUAL PUBLIC BENEFITS

Students and society at large both benefit from higher earnings. Indeed, the principal motivation for publicly funded higher education is to raise the productivity of the workforce and the incomes the students will enjoy once they complete their studies. Society benefits in other ways as well. Higher education is associated with a variety of lifestyle changes that generate savings; e.g., reduced welfare and unemployment, improved health, and reduced crime. Note that these are *external* or *incidental* benefits of education. Colleges are created to provide education, not to reduce crime, welfare and unemployment, or improve health. The fact that these incidental benefits

occur and can be measured, however, is a bonus that enhances the economic attractiveness of the college operations. It should not be taken to mean that taxpayers should channel more money to colleges on the strength of these external benefits. Our purpose is simply to bring to the attention of education stakeholders that the activities of the 17 colleges in the OCC system impact society in many more ways than simply the education they provide. In so doing, we have identified and measured some social benefits obviously related to educational achievements and included them in the mix of impacts generated by the colleges.

Assuming state and local taxpayers represent the public, the public benefits of higher education can be gauged from two perspectives, 1) a *broad* perspective that tallies all benefits, and 2) a *narrow* perspective that considers only changes in the revenues and expenditures of state and local government.

Higher Earnings

Broad Perspective: Higher education begets higher earnings. The economy generates more income than it would absent the CC skills embodied in the labor force. From the broad taxpayer perspective, the total increase in regional earnings is counted as benefits of CC education, adjusted down by the benefits accruing to students covered by the statewide composite alternative education variable in **Table 2.9** further below (23.5%) – these students would still attend college elsewhere even if the OCC did not exist.

Narrow Perspective: Higher regional earnings translate into higher state and local *tax collections*. In the narrow taxpayer perspective we assume that the state and local authorities will collect 16.8% of the higher earnings in the form of taxes – the estimated composite of all taxes other than the federal income taxes.[4]

Health Savings

The improved health of students generates savings in three measurable ways: 1) lower absenteeism from work, 2) reduced smoking and 3) reduced alcohol

[4] The tax data are obtained from the U.S. Census Bureau. See also **Appendix 2**.

abuse (**Table 2.6**). These variables are based on softer (i.e., less-documented) data. In general, statistics show a positive correlation between higher education and improved health habits. The table shows the calculated reductions in the incidences of smoking and alcohol abuse as a function of adding the higher education, also linked to the gender and ethnicity profiles of the OCC student body. Recall from above, the health savings are reduced by 10% in recognition of causation variables not yet identified.

Broad Perspective: The benefits from reduced absenteeism are equal to the average earnings per day multiplied by the number of days saved (less the students covered by the alternative education variable, as above). These are benefits that accrue largely to employers. Smoking- and alcohol-related savings accrue mostly to the individuals who will *not* have to incur the health-related costs. In the broad taxpayer perspective, however, these benefits accrued to employers and individuals are also public benefits.

Narrow Perspective: Taxpayers benefit from reduced absenteeism to the extent that state and local government is an employer. Accordingly, we assume a taxpayer's portion of absenteeism savings at 12.8%, equal to the estimated public portion of employment in the region.[5] As for smoking- and alcohol-related savings, the taxpayers benefit to the extent that state and local health subsidies (to hospitals, for example) are reduced. We assume that 6% of the total benefits can be counted as taxpayer savings.

Table 2.6. Reduced Absenteeism, Smoking and Alcohol Habits

	Absenteeism		Smoking		Alcohol Abuse	
Education Level	Days	%/Year	Average	Reduction	Average	Reduction
< HS/GED	9	3%	32%	NA	10%	NA
HS/GED equivalent	5	2%	28%	11%	9%	7%
1 year post HS or less	4	2%	24%	15%	8%	12%
2 years post HS or less	4	2%	20%	19%	7%	14%
> AD	3	1%	15%	24%	5%	18%

1. Absenteeism: U.S. Department of Labor, Bureau of Labor Statistics, Division of Labor Force Statistics, ftp://ftp.bls.gov/pub/special.requests/lf/aat46.txt

2. Smoking: *Health*, United States, 2001, Table 61: Centers for Disease Control and Prevention; National Center for Health Statistics; and *The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation*, U.S. Treasury Department, http://www.ustreas.gov/press/releases/docs/tobacco.pdf

3. Alcoholism: *Health Promotion and Disease Questionnaire* of the 1990 National Health Interview Survey of the Center for Health Statistics; and National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism.http://www.nida.nih.gov/EconomicCosts/Index.html.

[5] The ratio of state and local earnings over total earnings in the US (Regional Economic Information System – REIS, Bureau of Economic Analysis, Dept. of Commerce, 1998).

Figure 2.6. Days of Absenteeism by Education Levels

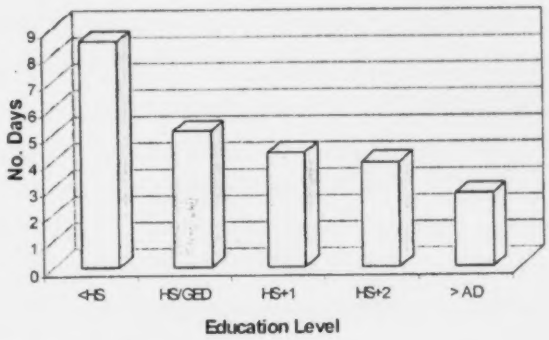


Figure 2.7. Average Incidence of Smoking by Education Levels

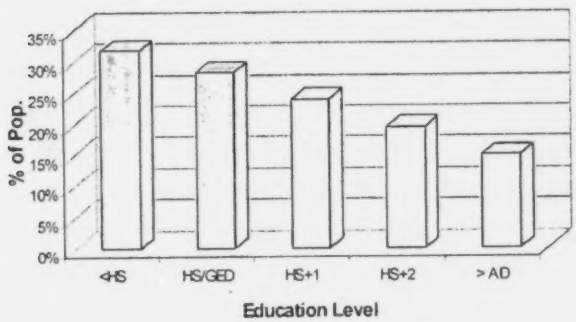
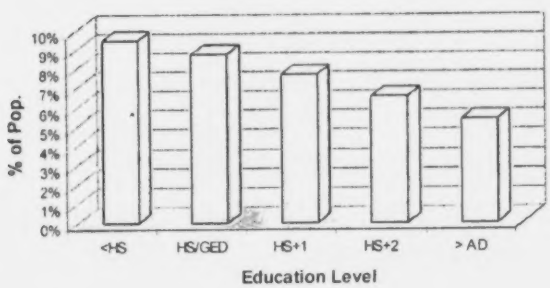


Figure 2.8. Average Incidence of Alcohol Abuse



Crime Reduction Benefits

The first column of **Table 2.7** relates the probabilities of incarceration to education levels – incarceration drops on a sliding scale as education levels rise (linked to the gender and ethnicity profile of the aggregate student body). The percentage reductions are based on total prison population relative to the population at large.[6] The implication is, as people achieve higher education levels, they are statistically less likely to commit crimes. The difference between before and after comprises the benefit attributable to education.

We identify three types of crime-related expenses, 1) the expense of prosecution, imprisonment, and reform, tracked as incarceration expense, 2) victim costs, and 3) productivity lost as a result of time spent in jail or prison rather than working. As with our other social statistics, crime-related expenses are reduced by 10% in recognition of other causation factors.

Broad Perspective: From the broad taxpayer perspective, all reductions in crime-related expenses are counted as a benefit (less the students covered by the alternative education variable, as above).

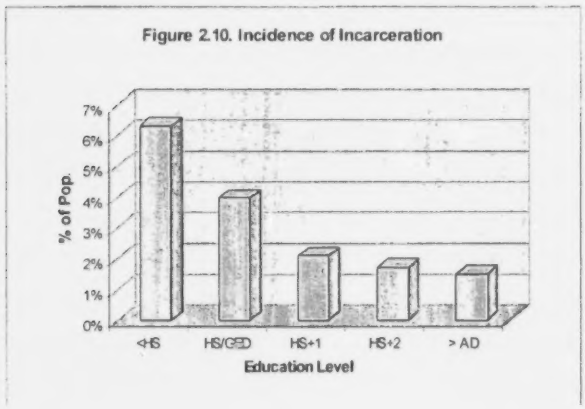
Narrow Perspective: We assume that nearly all (80%) of the incarceration savings accrue to the state and local taxpayers – federal funding covers the remainder. Crime victim savings are avoided costs to the potential victims, not to the taxpayers. As such, we claim none of these as taxpayer savings. Finally, we apply our "composite" state and local government average tax rate (16.8%) to the added productivity of persons *not* incarcerated to arrive at the taxpayer benefits.

[6] See also: http://www.ojp.usdoj.gov/bjs/abstract/p00.htm.

Table 2.7. Incarceration Rates

Education Level	Average	Reduction
< HS/GED	6%	NA
HS/GED equivalent	4%	37%
1 year post HS or less	2%	47%
2 years post HS or less	2%	18%
> AD	2%	11%

1. *Literacy Behind Walls*, National Center for Education Statistics, Prison Literacy Programs, DIGEST No. 159 Literacy in Corrections, Correctional Educational Association,
2. T. P. Bonczar & Alan J. Beck; Lifetime likelihood of Going to State or Federal Prison, US Department of Justice, Office of Justice Programs, March 1997.
3. *Criminal Justice Expenditure and Employment*, Extracts Program (CJEE), author: Sidra Lea Gifford, askbjs@ojp.usdoj.gov (202) 307-0765, 12/14/00.



Welfare and Unemployment Reduction Benefits

Higher education is statistically associated with lower welfare and unemployment. **Table 2.8** relates the probabilities of individuals applying for welfare and/or unemployment assistance to education levels (linked to the gender and ethnicity profiles of the student bodies). As above, all welfare and unemployment savings are reduced by 10% in recognition of other causation factors.

Broad Perspective: Reduced welfare and unemployment claims are counted in full as benefits in the broad taxpayer perspective (less the students covered by the alternative education variable, as above).

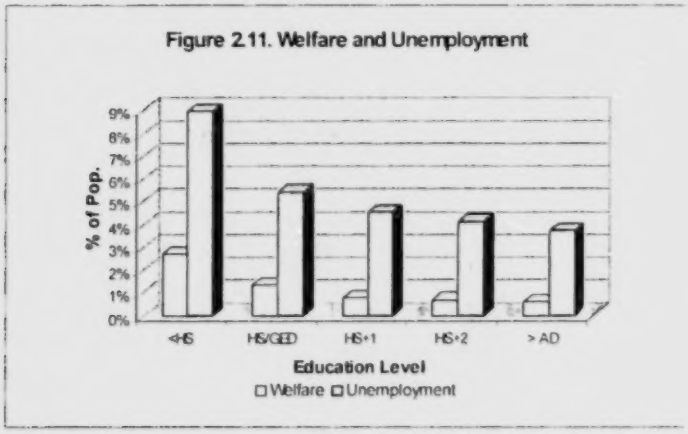
Narrow Perspective: Taxpayer benefits from reduced welfare are limited to 16%--the extent to which the state and local taxpayers subsidize the welfare system. None is claimed for unemployment, because most of these costs are borne by the Federal Government.

Table 2.8. Welfare & Unemployment

	Welfare		Unemployment	
Education Level	Average	Reduction	Average	Reduction
< HS/GED	3%	NA	9%	NA
HS/GED equivalent	1%	50%	5%	39%
1 year post HS or less	1%	44%	5%	17%
2 years post HS or less	1%	9%	4%	9%
> AD	1%	11%	4%	9%

1. Temporary Assistance for Needy Families, TANF Program 3rd annual report to Congress, US Dept of Health and Human Resources, Table 10:12.
2. The Heritage Foundation, *Means-Tested Welfare Spending: Past and Future Growth*, Testimony by Robert Rector, (3/07/01).

Figure 2.11. Welfare and Unemployment



COSTS

There are two main cost components considered in the analytic framework: 1) the cost incurred by the student, including the opportunity cost of his or her time (represented by the earnings foregone while attending college), and expenses for tuition and books, and 2) the cost incurred by state and local government taxpayers, part of the college's operating and capital costs (the budget – see **Table 2.1**). These are briefly discussed below.

BEST COPY AVAILABLE

Opportunity Cost of Time

The opportunity cost of time is, by far, the largest cost. While attending college, most students forego some earnings, because they are not employed or are employed only part-time. The assumptions are discussed in conjunction with **Table 2.2** above. For the non-working students, the opportunity cost is the full measure of the incomes not earned during their CC attendance. For students working part-time, the opportunity cost is the difference between what they could make full-time less what they are making part-time. No opportunity cost of time is charged for the fully employed. The opportunity costs are derived from the earnings categories by education entry levels given in **Table 2.5**, although with some important modifications, as briefly described below:

- The earnings in **Table 2.5** are averages based on trajectories of earnings for all ages, from 17 to 65 (roughly defining the time spent engaged in the workforce).

- The average earnings, therefore, define the mid-point of the trajectory beginning with the average minimum wage of $12,480 we assume will be earned per year by 17-year-old workers. By the time a worker with an education level of less than HS/GED is 41 years old – the approximate working life span midpoint – he or she will have reached the level of earnings indicated in **Table 2.5**.[7]

- The opportunity cost of time is then conditioned by the average age of the student (33.9 years, see **Table 2.4**). In particular, the average earnings at age 41 are adjusted downward to reflect the average earnings at age 33.9, assuming a straight line of earnings across the assumed 17 to 65 working life span.

The Budget

Beyond the student perspective, our assessment of the Oregon Community College System considers the benefits and costs from the state and local

[7] The calculation: 65 - 17 = 48 years in the workforce. The mid-point: 48 years/2 = 24 years. The average age of worker defining the $16,751 earnings level (<HS/GED) = 24 years midpoint + 17 years, or 41.

government taxpayer perspective. Accordingly, only the state and local government revenues in **Table 2.1** are included as costs in the investment and benefit-cost assessment. All else equal, the larger the other revenue sources in **Table 2.1** (federal grants, student tuition, and contract revenues) relative to state and local government revenues, the larger will be the relative economic payback to the taxpayers.

OTHER ASSUMPTIONS

Table 2.9 lists several other assumptions imbedded in the analytic model: a) the discount rate and time horizon, b) crime-related costs (incarceration costs are inclusive of the cost per prison year plus all costs associated with arrest, investigation, trial and finally incarceration), c) welfare and unemployment costs per year[8], and d) health-related costs.[9] Annual real increases in costs are also included, although these are not used in the study. The alternative education opportunity assumption is discussed further below in association with the regional economic impacts.

[8] As indicated in the table, we assume that the average duration on welfare and unemployment is 4.0 and 4.0 years, respectively. This means that, over the next 30 years or so, the cumulative incidence of welfare and/or unemployment will add to this duration over the 30-year period – it is not a consecutive period.
[9] The incarceration, health, welfare and unemployment probability and cost variables are internal to the analytic model.

Table 2.9. Miscellaneous Variables

	Variables
Discount rate	4.0%
Time horizon, years to retirement	31.1
Average real earnings increase per year	0.5%
Avg. cost/prison year (all incl.: arrest, trial, incarc., rehab. etc.)	$82,415
Avg. length of incarc. (total years over 30-year time horizon)	4.0
Real cost increase per prison year	0.0%
Average victim cost	$ 60,219
Real victim cost increase per year	0.0%
Average cost per welfare year	$ 75,138
Avg. duration on welfare (total years over 30-year time horizon)	4.0
Welfare/unemployment cost increase per year	0.0%
Average cost per unemployment year	$ 36,249
Avg. duration on unempl. (total years over 30-year time horizon)	4.0
Smoking-related medical costs per year	$ 2,962
Alcohol-related medical costs/year	$ 7,946
Real medical cost increase per year	0.0%
Alternative education opportunities	23.5%

Assumptions adapted from:

1. Bureau of Justice Statistics, Table #. 05 Total direct and intergovernmental expenditure, by activity and level of government, fiscal years 1980-97, Criminal Justice Expenditure and Employment Extracts Program, 12/14/00.

2. OICJ The Extent and Costs of Victimization, Crime and Justice: The Americas, Dec-Jan 1995

3. The Heritage Foundation, *Means-Tested Welfare Spending: Past and Future Growth*, Testimony by Robert Rector, (3/07/01).

4. U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/news.release/annpay.t01.htm

5. The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation, http://www.ustreas.gov/press/releases/docs/tobacco.pdf

6. National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, found at: http://www.nida.nih.gov/EconomicCosts/Index.html.

STATEWIDE ECONOMIC BENEFITS

In general, the economy is affected by the presence of Oregon's 17 CCs in two ways: from their day-to-day operations (including capital spending), and from students who enter the workforce with increased skills and know-how. Day-to-day operations of the colleges provide the *direct* jobs and earnings of the faculty and staff, and additional *indirect* jobs and earnings through the action of multiplier effects. At the same time, students expand the skill-base of the workforce, deepening the economy's stock of human capital, which attracts new industry and makes existing industry more productive.

Estimating these economic effects requires a number of interrelated models. Multiplier effects are obtained with an input-output (IO) model constructed

BEST COPY AVAILABLE

for the state of Oregon.[10] Estimating CC operation effects requires an additional model that takes CC expenditures, deducts spending that leaks from the economy, and bridges what is left to the sectors of the IO model.

Several steps are involved in estimating the skill-enhancing effect of past students on the workforce, and in turn, the effect of these workforce changes on the economy. First, the number of past students still active in the workforce is estimated and converted to total workforce embodied CHEs. In the **Annual Private Benefits** section above an estimate was made of the incremental (per CHE) effect on student earnings of OCC instruction. This estimate is applied to total embodied CHEs to arrive at an initial estimate of the past student income effect. In arriving at the final estimate, the initial value must first be reduced to account for a collection of substitution effects, and then expanded to capture a collection of demand and supply-side effects. The end result is an estimate of the impact of past student skills and increased productivity on the size of the economy.

This section is divided into two subsections. The first documents our estimation of day-to-day operations effects. The second documents our estimation of the effect of past student skills on the economy.

The Impact of OCC Operations

The first step in estimating the impact of the Oregon Community College System operations is to assemble a profile of the combined operating and capital expenditures (see **Table 2.10**). These data are drawn from the college budgets and collected into the categories of **Table 2.10**. Column 1 simply shows the total dollar amount of spending. Columns 2 through 5 apportion that spending to in-state and out-of-state vendors. The net local portion is

[10] The Oregon Community College System model is constructed according to traditional practice using national model IO coefficients and secondary data. The models employ the IO accounting framework presented in Robison (1997) and are equipped with purchase coefficients adapted from Stevens et. al., 1983.

derived in Column 6. The spending data shown in this column are fed into the IO model.[11]

The information on total spending required for column 1 is generally readily available, though sorting specific items to the categories of the table can take some time. Information in columns 2 through 5 is generally more problematic—hard data are scarce on the local/non-local split. In these cases, the institutional researchers at each college use their best judgment.

The first row in **Table 2.10** shows salaries and wages. These *direct* earnings are part of the statewide overall earnings, and appear as "Direct Earnings of Faculty and Staff" in the table of findings, **Table 3.10**. Dollar values in **Table 2.10** column 6, "net local spending," are fed into the IO model. The IO model provides an estimate of indirect effects, and these appear as "Indirect Earnings" in **Table 3.10**.

Table 2.10. Profile of College Spending in and out of State Economy ($ Thousands)

Spending Categories	Tot. Dollar Amount (1)	In-State % (2)	Out of State % (3)	In-State % (4)	Out of State % (5)	Net In-State Spending (6)
Salaries and Wages	$285,245	94%	6%			$267,758
Travel	$5,088	71%	29%			$3,616
Electricity and natural gas	$5,925	89%	11%			$5,273
Telephone	$3,210	77%	23%			$2,481
Building Materials & Gardening Supplies	$6,433	79%	21%	64%	36%	$5,082
General Merchandise Stores	$45,572	74%	26%	42%	58%	$33,661
Eating & Drinking	$1,786	69%	31%			$1,236
Maintenance & Repair Construction	$6,628	91%	9%			$6,035
New Construction	$32,885	92%	8%			$30,138
Insurance	$9,663	53%	47%			$5,092
Legal Services	$695	92%	8%			$641
Credit Agencies	$10,066	69%	31%			$6,924
U.S. Postal Service	$1,862	73%	27%			$1,356
Accounting, Auditing & Bookkeeping	$680	94%	6%			$640
Marketing	$1,190	72%	28%			$855
Other Business Services	$39,978	81%	19%			$32,571
Water Supply & Sewerage Systems	$905	94%	6%			$852
Printing & Publishing	$4,198	87%	13%			$3,668
Rental Property	$5,421	93%	7%			$5,065
Services to Buildings	$1,930	66%	34%			$1,264
Unemployment Compensation	$863	91%	9%			$787
Honoraria + other payments to households	$45,149	90%	10%			$40,657
Total	$515,372					$455,654

Note: this table provides details for the summary of the college role in the regional economy (Table 3.10)

[11] **Table 2.10**, by itself, provides very important information to present to in-state audiences—Chambers of Commerce, business establishments, Rotary clubs, and the like. The table demonstrates that the colleges are "good neighbors," evidenced by the fact that an estimated 88% of all college expenditures benefit state vendors ($455,654 / $515,372 = 88%).

BEST COPY AVAILABLE

The Direct Economic Development Effects of Students

In the next chapter we estimate that the average CHE of instruction is worth $88 per year in increased employee earnings (see **Table 3.3**). This is the average value across the student's entire working life.[12] At any point in time, the workforce will embody thousands of CHEs of past Oregon Community College System instruction. We obtain an initial estimate of the direct past student economic development effect by multiplying the total hours of embodied instruction by the $88 value.

A separate model is constructed to estimate the CHEs of past instruction embodied in the workforce. **Table 2.11** indicates variables critical to the model, while **Table 2.12** shows the output of the model itself. Considering **Table 2.12** one column at a time conveys the logic of the model.

Column 1 provides an estimate of the enrollment history (unduplicated headcount) of the OCC students. Column 2 is the same as column 1, but net of students who leave the region immediately upon leaving the system. As shown in the table, 95% of the students remain in state upon leaving the CC, 5% leave.

Column 3 goes one step further—a comparison of columns 2 and 3 indicates that all past students have left the system except for the last three years (1997 - 2000) where students are still enrolled (the leaver assumptions are shown in column 8).

Column 4 further reduces leavers to focus only on those who have settled into a somewhat permanent occupation. As shown in column 9 (the "settling factor"), it is assumed that all students settle into permanent occupations by their fourth year out of school. Settling-in assumptions are specified in **Table 2.2** above.

[12] In reality, the earnings increment due to OCC skills might be expected to start low and grow over the course of a student's working life. OCC-acquired skills open doors for the students, giving them a chance to excel and advance in their careers. Our earnings increment due to OCC attendance is an average across all age levels (as also discussed above in relation to the opportunity cost of time variable). It would thus overstate earnings in the early years and understate them in later years. Our interest, however, is to arrive at an estimate of the lifetime accumulated earnings increment. Use of the average for the entire course of student working lives should provide the proper aggregate estimate.

Column 5 transitions further from leavers who have settled into jobs to leavers still active in the current workforce. Here we net off workers who, subsequent to leaving college and settling into the workforce, have out-migrated, retired, or died. As shown in **Table 2.11**, roughly one-third of working past students will out-migrate, retire or die over the course of the next 30 years. This "30-year attrition" follows an assumed logarithmic decay function shown in column 10 labeled "active in workforce."

Column 6 shows the average CHEs generated per year back to 1971. These data were obtained by dividing total year-by-year CHEs by the corresponding headcount. Column 7 shows the product of the year-by-year average CHEs, and the estimate of the number of past students active in the current workforce in column 5. Looking to the total in Column 7, we estimate that the current Oregon workforce embodies some 58.0 million CHEs of past OCC instruction.

From Embodied CHEs to Direct Income Effects

An *upper-bound* estimate of the past student economic development effect is obtained by multiplying the total embodied CHEs (**Table 2.12**) by the estimated $88 per-CHE value (**Table 3.2**). The result of this calculation is still an upper bound, for reasons pertaining to economic development theory. We constructed a model to capture this dynamic, and thereby reduced the upper bound to arrive at the estimate of the direct past student economic development effect. Our model hinges on two assumptions for two polar case scenarios (**see Box**).

Note that with polar case scenario 1, we would reduce our upper-bound estimate to zero - i.e., an enhanced workforce skill base has no economic development effect. In contrast, with polar case scenario 2 we would accept the full upper-bound amount as our past student economic development effect. Obviously the true measure is somewhere in between.

There is considerable empirical literature on the economic development effects of education, and from this research we are able to adapt a documented adjustment factor. In particular, in a recent study Bils and Klenow (2000) survey past work on the economic development effects of

education, and advance a model of their own. Based on their findings, we reduce the upper bound to 30%of the potential (upper bound) total to arrive at our final estimate: thus $1,228.2 million of the upper bound value is counted as the direct past student economic development effect. These appear in **Table 3.10** under the heading "Earnings Attributable to Past Student Economic Development Effects," "Direct Earnings."

Box: Polar Cases

Polar Case Scenario 1. Assumption #1 under this scenario is that the rate of technical substitution between local skilled and unskilled workers is infinitely elastic. This means that newly skilled past OCC students are substituted for unskilled workers in a manner that creates no net additional regional earnings. Businesses simply replace lower productivity (and lower paid) unskilled workers with some smaller number of higher productivity (and higher paid) skilled workers, with no net change in overall output or earnings.

Assumption #2 is that the rate of technical substitution between in-state and out-of-state workers is infinitely elastic, and that the existence of a skilled workforce is not a factor in attracting new industry to the state. This means that existing industry can readily draw skilled workers from outside the state, and growth is driven by something other than skills in the workforce. Skilled workers are easily imported without extraordinary inducements or wage premiums that would otherwise increase costs and reduce competitiveness.

Polar Scenario 2. Assumption #1 is that the rate of technical substitution between skilled and unskilled workers is infinitely inelastic. Skilled workers are able to perform the same tasks at less expense than unskilled workers, and they are able to perform many tasks that unskilled workers cannot. Under this assumption, skilled workers increase efficiency, enable an expansion of the product line, and generally increase the competitiveness of existing industry. The result is an expansion of earnings as well as output.

Assumption #2 is that the rate of technical substitution between in-state and out-of-state workers is infinitely inelastic, and the existence of a skilled workforce is, therefore, a factor in attracting new industry to the state (there is a near stand-alone development theory based on the notion that skilled workers attract new industry – Borts and Stein, 1964).

BEST COPY AVAILABLE

The Indirect Economic Development Effects of Students

The direct earnings attributed to the OCC skills embodied in the current workforce are not the only past student economic development effects. Associated with the increased output and earnings is an increased demand for both consumer goods and services, and goods and services purchased by businesses as inputs. These, in turn, produce a set of economic multiplier effects as increased employee and business spending ripples through the other parts of the economy.

We assume that the students will acquire jobs in the *higher-stage* sectors of the economy (e.g., technical services and advanced manufacturing sectors, see Parr, 1999). For demand-induced effects, we compute a weighted average demand-driven earnings multiplier from the impact area IO model. Higher-stage sectors receive greater weight than lower-stage sectors. Demand-side indirect effects are obtained in the usual manner by applying the multiplier to the direct effect estimate.

There is still more. Economic development theory describes an "agglomeration" effect whereby growth itself stimulates growth. A new plant (A) established in a region attracts other plants to the same region (B, C, and D) that use A's outputs as inputs in their production processes. This in turn spawns another round of industry growth, and so on. To estimate agglomeration effects, we configure our economic IO model to provide a set of so-called supply-driven multipliers (see for example Miller and Blair, 1985). We then compute a weighted average supply-driven earnings multiplier, again favoring higher-stage sectors. Agglomeration (or supply-side) effects are obtained by applying the multiplier to the direct effect estimate.

Finally, a third key element is accounted for—the *alternative education opportunity variable* (see **Table 2.9**). This is technically not a cost variable, but rather a "negative benefit," one that recognizes the fact that, absent the OCC, some portion of the aggregate student body would obtain an education elsewhere. The problem is determining what this portion is. Clearly, 100% would be incorrect because not everyone would be able to attend a community college in a neighboring state. Indeed, an integral part of the CC

mission is to provide open educational access for those who cannot avail themselves of the alternatives. For the OCC, the assumption for this variable is 23%; i.e., the statewide economic benefits are reduced across the board by this amount.

Table 2.11. Critical Variables

Assumptions	Values
Current headcount of students	392,510
Students remaining in-state after leaving CC	95%
30-year attrition	33%
Decay rate	1.3%
Overall average of credits earned per student this year	10.9

Table 2.12. Estimating Credits of Instruction Embodied in the Workforce

		Subtract Students Migrating Immediately	Students who have left college (Leavers)	Leavers Who Have Settled Into Jobs	Settled into Jobs - Active in the Workforce	Average Credit Equivalents	Credits Embodied in the Workforce	Assumptions: % of Students in Workforce	Settling Factor	Active in Workforce
Year	1	2	3	4	5	6	7	8	9	10
1972	118,797	112,857	112,857	112,857	75,986	9.54	724,700	100%	100%	67.3%
1973	129,254	122,791	122,791	122,791	83,772	9.54	798,956	100%	100%	68.2%
1974	144,374	137,155	137,155	137,155	94,814	9.54	904,263	100%	100%	69.1%
1975	160,767	152,729	152,729	152,729	106,981	9.54	1,020,302	100%	100%	70.0%
1976	191,705	182,120	182,120	182,120	129,262	9.54	1,232,798	100%	100%	71.0%
1977	200,630	190,599	190,599	190,599	137,075	9.54	1,307,317	100%	100%	71.9%
1978	206,605	196,275	196,275	196,275	143,031	9.54	1,364,119	100%	100%	72.9%
1979	235,950	224,153	224,153	224,153	165,514	9.54	1,578,548	100%	100%	73.8%
1980	258,240	245,328	245,328	245,328	183,555	9.54	1,750,603	100%	100%	74.8%
1981	299,377	284,408	284,408	284,408	215,619	9.54	2,056,407	100%	100%	75.8%
1982	289,897	275,402	275,402	275,402	211,562	9.54	2,017,719	100%	100%	76.8%
1983	242,886	230,742	230,742	230,742	179,607	9.54	1,712,955	100%	100%	77.8%
1984	231,998	220,395	220,395	220,395	173,831	9.54	1,657,863	100%	100%	78.9%
1985	234,329	222,613	222,613	222,613	177,910	9.54	1,696,768	100%	100%	79.9%
1986	238,306	226,391	226,391	226,391	183,331	9.54	1,748,468	100%	100%	81.0%
1987	242,372	230,253	230,253	230,253	188,934	9.54	1,801,904	100%	100%	82.1%
1988	262,489	249,365	249,365	249,365	207,331	9.54	1,977,365	100%	100%	83.1%
1989	280,680	266,646	266,646	266,646	224,642	9.54	2,142,464	100%	100%	84.2%
1990	304,459	289,236	289,236	289,236	246,908	9.54	2,354,818	100%	100%	85.4%
1991	316,695	300,860	300,860	300,860	260,240	9.54	2,481,968	100%	100%	86.5%
1992	324,016	307,815	307,815	307,815	269,790	9.54	2,573,048	100%	100%	87.6%
1993	323,228	307,067	307,067	307,067	272,706	9.54	2,600,859	100%	100%	88.8%
1994	321,248	305,186	305,186	305,186	274,633	9.54	2,619,237	100%	100%	90.0%
1995	314,428	298,707	298,707	298,707	272,370	9.54	2,597,658	100%	100%	91.2%
1996	320,834	304,792	304,792	304,792	281,608	9.54	2,685,762	100%	100%	92.4%
1997	335,441	318,669	318,669	318,669	298,337	9.54	2,845,311	100%	100%	93.6%
1998	348,480	331,056	331,056	331,056	314,048	9.54	2,995,146	100%	100%	94.9%
1999	355,516	337,740	337,569	303,812	292,029	9.54	2,785,148	100%	90%	96.1%
2000	373,982	355,283	347,289	260,467	253,688	9.54	2,419,478	98%	75%	97.4%
2001	392,510	372,885	316,952	158,476	158,476	9.54	1,511,421	85%	50%	100.0%
Embodied Total							57,963,374			

BEST COPY AVAILABLE

Chapter 3
PRIVATE, PUBLIC AND STATEWIDE ECONOMIC BENEFITS

INTRODUCTION

This chapter summarizes the main OCC case study results in four sections: 1) the aggregate annual private and public benefits; 2) these same benefits measured per CHE and per student; 3) future benefits expressed in terms of NPV, RR, and B/C ratio, and 4) the statewide economic benefits.

ANNUAL BENEFITS

Higher Student Earnings

The annual benefits are summarized in **Tables 3.1** and **3.2**. We begin with earnings growth in **Table 3.1**. Last year, each student completed, on average, 10.9 CHEs at OCC (see **Table 2.4**), only a fraction of one full year of study. This is because the majority of students attend for a variety of purposes as discussed in conjunction with **Table 2.4**; for some, to make progress towards an eventual degree, and for others, simply to acquire certain skills that will increase their productivity in the workforce. A total of 392,554 students will capture $342.5 million worth of higher annual earnings based on this average increase in educational attainment.

Social Savings

Health-Related Savings

Also in **Table 3.1**, we see that improved health, lower welfare and unemployment, and lower crime will result in annual dollar savings to the taxpayers of $36.9 , $8.6 , and $16.0 million (rounded). In **Table 3.2**, these same results are presented in greater detail—health-related absenteeism will decline by 123,170 days per year, translating to a total of 474 years' worth of productivity gained per year (based on 260 workdays per year). Annual total

dollar savings from reduced absenteeism days equals $14.8 million. There will be 4,446 fewer smokers and 1,122 fewer alcohol abusers, amounting to annual total dollar savings of $13.17 and $8.9 million, respectively, inclusive of insurance premiums, personal payments, and withholding for Medicare and Medicaid.

Crime-Related Savings

There will be 1,025 fewer people incarcerated as a result of the higher education obtained, saving the taxpayers a grand total of some $9,961,253 per year. The assumptions pertaining to these results are listed in **Table 2.9** in the previous chapter. They are based on an average duration of 4.0 years incarcerated at an average cost of $82,415 per year (inclusive of arrest, prosecution, incarceration, and rehabilitation).[13] Fewer people incarcerated means more people gainfully employed – this translates to $3,941,245 in additional annual earnings for the local community. Victim costs will be reduced by $2,091,966 per year.

Welfare and Unemployment Savings

There will be 420 and 866 fewer people on welfare and unemployment, respectively, in the community. The corresponding total dollar savings for the local community amounts to $8,617,382 ($244,598 welfare + $8,372,784 unemployment savings) for one year, assuming that the average time spent on welfare and unemployment is 4.0 years (see **Table 2.9**).

Total Public Benefits

All told, there will be $61.5 million in public savings per year in the community – the sum of all health, crime, and welfare/unemployment benefits in **Table 3.2.**

[13] The calculation is as follows: 1,025 not incarcerated x $82,415 x 4.0 years / 31.1 years to retirement from Table 2.9 = $679,577 .

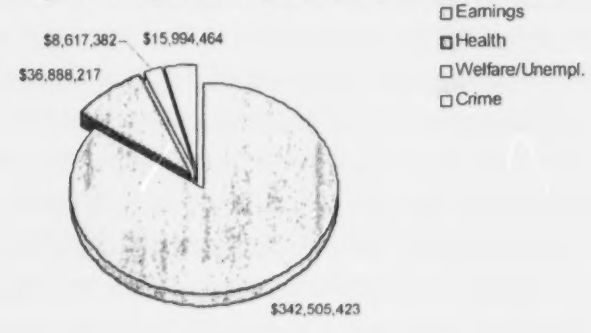
Table 3.1 Student Body Achievements, Higher Earnings

Level of Education	Higher Earnings	Social (External Benefits) Improved Health	Lower Welfare Unemployment	Lower Crime	Total
< HS/GED	$25,445,099	$1,833,230	$1,861,874	$1,751,436	$30,891,639
HS/GED equivalent	$30,730,662	$1,974,527	$1,537,894	$1,546,189	$35,789,272
1 year post HS or less	$106,884,967	$11,435,561	$3,317,464	$11,090,686	$132,728,678
2 years post HS or less	$112,577,334	$7,307,240	$1,081,432	$505,785	$121,471,791
> Associate Degree	$66,867,360	$14,337,659	$818,718	$1,100,369	$83,124,106
Total	$342,505,423	$36,888,217	$8,617,382	$15,994,464	$404,005,486

Table 3.2. Summary of Annual Benefits

	Units	Earnings	Social Savings
Higher earnings	NA	$342,505,423	
Health benefits			
Absenteeism savings (days)	123,170	NA	$14,801,633
Fewer smokers, medical savings (# persons)	4,446	NA	$13,170,254
Fewer alcohol abusers (# persons)	1,122	NA	$8,916,330
Crime benefits			
Incarceration savings (# persons)	1,025	NA	$9,961,253
Crime victim savings	NA	NA	$2,091,966
Added productivity (fewer incarcerated)	NA	NA	$3,941,245
Welfare/unemployment benefits			
Welfare savings (# persons)	420	NA	$244,598
Unemployment savings (# persons)	866	NA	$8,372,784
Total		$342,505,423	$61,500,062

Figure 3.1. Higher Earnings and Social Savings per Year



ANNUAL BENEFITS PER CHE AND PER STUDENT

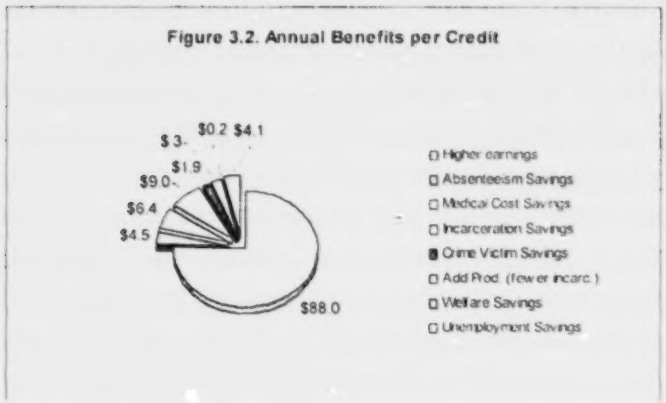
The aggregate benefits reported in **Tables 3.1** and **3.2** above are expressed per CHE and per student in **Table 3.3**. On average, students capture: a) $88 per

BEST COPY AVAILABLE

year in higher earnings per CHE,[14] and b) $890 per year in higher earnings per student on the basis of the number of CHEs completed. **Converted to a full-year-equivalent (30 CHEs), the annual earnings would amount to $3,688 per student.** On average, the social benefits per CHE range from a low of $0 for Welfare Savings to a high of $9 per CHE for Incarceration Savings. On a per student basis, they range from a low of $2 per student for Welfare Savings to a high of $86 for Incarceration Savings. On a full-year equivalent basis (45 CHEs), the social savings would amount to $1,149 per student (the total of $4,837 less $3,688 of higher private earnings as indicated in **Table 3.3**).

Table 3.3. Annual $ per Credit and Student

	Per Credit	Per Student	Annualized
Higher earnings	$88	$890	$3,688
Absenteeism Savings	$5	$43	$178
Medical Cost Savings	$6	$61	$254
Incarceration Savings	$9	$86	$356
Crime Victim Savings	$2	$18	$75
Add Prod. (fewer incarc.)	$3	$28	$115
Welfare Savings	$0	$2	$8
Unemployment Savings	$4	$39	$163
Total	$117	$1,168	$4,837



[14] Thus, a student attending for 10 CHEs will add $880 per year to the lifetime earnings. A longer curriculum will add substantially more. The earnings expectations are portrayed as linear but with many computational steps involved (see **Chapter 2**). The extrapolation is based on the averages of low earnings additions for leavers completing few CHEs, plus higher additions for leavers completing more CHEs.

BEST COPY AVAILABLE

THE INVESTMENT ANALYSIS: INCORPORATING FUTURE BENEFITS

The results in **Tables 3.1** and **3.2** provide only a single-year snapshot of the benefits. As long as the students remain in the workforce, however, the CC-acquired skills continue to add productivity over time. In the investment analysis, the higher earnings and avoided costs are projected into the future over the working life of the student, discounted to the present, and then compared to the present costs of education. The investment is feasible if all discounted future benefits are greater than or equal to the costs.[15]

The investment analysis results are shown in **Table 3.9** (in the aggregate, per CHE and per student). The end results sought are the **Net Present Value (NPV)**, **Rate of Return (RR)**, the **Benefit/Cost (B/C)** ratio and the **Payback Period**.[16] These are simply different ways of expressing the results. All of the present value results shown are intermediary steps that *ultimately generate* the NPVs, RRs and B/C ratios.

We begin with some definitions in **Table 3.4**. **Private** benefits are the higher earnings captured by the students themselves. **Broad taxpayer benefits** are the additions to earnings plus lower overall expenditures related to health, crime, welfare and unemployment. **Narrow taxpayer benefits** include increased state and local tax revenues (from increased incomes), and savings from reduced state and local government expenditures for incarceration, health and welfare.

---

[15] Future benefits are worth less than present benefits. The present value of $5,000 to be received 30 years from today is worth only $1,603 given a 4% discount rate ($5,000/(1.04)^{30} = $1,603). If the same benefits occur each year for 30 years, each year's benefit must be discounted to the present, summed and collapsed into one value that represents the *cumulative* present value of all future benefits. Thus, the present value of 30-years' worth of $5,000 per year is $90,000.

[16] The criteria for feasibility: a) NPV must be positive or equal to zero; b) RR must be equal to or greater than the returns from other similar risk investments; c) the B/C ratio must be equal to or greater than 1; and d) the payback period is the number of years of benefits required to fully recover the investment made.

Table 3.4. Some Definitions

Definitions	
Student Benefits	Higher earnings, captured by the students
Taxpayer Benefits: Broad	Additions to earnings plus lower overall expenditures related to health, crime, welfare and unemployment
Taxpayer Benefits: Narrow	Increased state & local government tax collections plus lower state & local govt. exp. related to health, crime, welfare and unemployment
Student Costs	Tuition (**Table 2.1**) + opportunity cost of time
Taxpayer Costs	Taxes (state and local, see **Table 2.1**)
Results:	
Student Perspective	Student Benefits / Student Costs
Taxpayer Perspective: Broad	Taxpayer Benefits (Broad) / Taxpayer Costs
Taxpayer Perspective: Narrow	Taxpayer Benefits (Narrow) / Taxpayer Costs

On the cost side, **student costs** consist of the tuition paid by the students (17.9% of the total in **Table 2.1**) and, most importantly, the opportunity cost of time (the earnings foregone). Also included here are the other sources of institutional revenues from private sources (11.0% in the case of OCC). The **taxpayer costs** consist of the state and local tax items in **Table 2.1**, or a total of 17.4% plus 40.2% = 58%.

The opportunity cost (earnings foregone) incurred by the student body in the aggregate is estimated in **Table 3.5**. Beginning with the overall average statistical annual income of the student body (given gender and ethnicity characteristics), we first deduct the retired student body (12.2%) to arrive at the net number of students subject to opportunity cost calculations – 344,640 students. The 97,925 students **not working** are charged the full opportunity cost of time, or $721,530,632 . The 246,715 **working** students are charged only a fraction of the full opportunity cost (61%), or $703,616,713 as indicated in the table. Finally, we adjust the opportunity cost downward by the Pell and other student aid grants and the estimated 10% adjustment for the restricted use of these grants for tuition and fees.

Table 3.5 Opportunity Costs (Earnings Foregone), $ per Year

			Opp. Cost
Avg. statistical annual income of given gender and ethnicity profile		$30,525	
CHEs per student (net of retired)	10.9		
Avg. term in residence and avg. income while in residence	24%	$7,388	
Total number of students		392,510	
Less retired %	12.2%	47,870	
Remaining students subject to opportunity cost computation		344,640	
Students not working while attending college and opportunity cost	28%	97,925	$721,530,632
No. of working students		246,715	
% working part time, earnings relative to stat. averages, and opp. cost	61%	$2,852	$703,616,713
Total opportunity cost			$1,425,147,346
Pell and other student aid		$33,134,169	
Restricted portion of student aid (tuition and fees)	10%	$3,313,417	($29,820,752)
GRAND TOTAL STUDENT OPPORTUNITY COST			$1,395,326,594

We also present the results in different ways. **First**, the student perspective results indicate whether the OCC education pays by comparing the private benefits (higher earnings) to the private costs. **Second** (as discussed in the previous chapter), we compare *all* private and public benefits to the public costs (the state and local taxpayer contributions in **Table 2.1**) in a **broad taxpayer perspective** in present value terms. **Third** and finally, in a **narrow taxpayer perspective**, we compare only a portion of the public benefits (taxpayer actual savings) to the public costs; i.e., do state and local taxpayer investments of $336,167,859 (**Table 2.1**) pay off in terms of the public savings generated?

The Student Perspective

The collective investment of the students (time and money) is assessed in **Table 3.6.** Column 1 tracks the increased earnings of the student body as they leave the CC, and follows them over the course of their assumed working life of 30 years or so. The upward trend in earnings reflects an assumed 0.5% per year real increase in earnings over the course of their careers. Column 2 is simply column 1 reduced by the 10% discount value that accounts for causation factors affecting student earnings. Column 3 shows the cost of the single-year's education. Finally, Column 4 looks at the educational investment from a cash flow perspective, subtracting annual costs from the annual benefits.

Does attendance at Oregon's 17 community colleges make economic sense for the students? The answer is a resounding **yes**. The future stream of benefits

BEST COPY AVAILABLE

(higher earnings) accruing to the students has an NPV of $4,331,778 **(Table 3.6)** – a positive NPV (greater than zero) indicates that the investments made are strongly feasible. The B/C ratio of 3.9 is strongly positive since the ratio is well above 1. The RR of 23.9% is also well above the long-term rates of return obtainable in the stock or bond markets, and certainly above the 4.0%discount rate used in the analysis. In the long run, therefore, the average OCC student will be substantially better off attending the college. The payback period for a student (tuition plus the earnings foregone) is 5.3 years – the higher earnings received beyond that period are pure economic rent – or a persistent earnings flow over and beyond the initial investments.

Table 3.6. Student Earnings ($ Thousands)

	1	2	3	4
Year	Higher Earnings Gross	Higher Earnings Net	Cost	Net Cash Flow
1	$273,966	$246,570	$1,558,496	($1,311,927)
2	$275,336	$247,803	$0	$247,803
3	$358,453	$322,608	$0	$322,608
4	$360,245	$324,221	$0	$324,221
5	$362,046	$325,842	$0	$325,842
6	$363,857	$327,471	$0	$327,471
7	$365,676	$329,108	$0	$329,108
8	$367,504	$330,754	$0	$330,754
9	$369,342	$332,408	$0	$332,408
10	$371,189	$334,070	$0	$334,070
11	$373,045	$335,740	$0	$335,740
12	$374,910	$337,419	$0	$337,419
13	$376,784	$339,106	$0	$339,106
14	$378,668	$340,801	$0	$340,801
15	$380,562	$342,505	$0	$342,505
16	$382,464	$344,218	$0	$344,218
17	$384,377	$345,939	$0	$345,939
18	$386,299	$347,669	$0	$347,669
19	$388,230	$349,407	$0	$349,407
20	$390,171	$351,154	$0	$351,154
21	$392,122	$352,910	$0	$352,910
22	$394,083	$354,674	$0	$354,674
23	$396,053	$356,448	$0	$356,448
24	$398,033	$358,230	$0	$358,230
25	$400,024	$360,021	$0	$360,021
26	$402,024	$361,821	$0	$361,821
27	$404,034	$363,630	$0	$363,630
28	$406,054	$365,449	$0	$365,449
29	$408,084	$367,276	$0	$367,276
30	$410,125	$369,112	$0	$369,112
31	$412,175	$370,958	$0	$370,958
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
NPV		$5,830,332	$1,498,554	$4,331,778
IRR				23.9%
B/C ratio				3.9
Payback (years)				5.3

BEST COPY AVAILABLE

The Broad Taxpayer Perspective

Table 3.7 assesses one year's operation of OCC from the broad taxpayer perspective. The taxpayers must weigh requests for OCC funding against the myriad of other public needs. As such, they need information to better allocate increasingly scarce resources between alternative and competing ends. Column 1 shows the stream of total benefits, including increased regional earnings, and social savings from reduced spending on incarceration, health, welfare and unemployment. Specifics on the estimation of values in column 1 are presented in **Volume 2: Detailed Results, Table 19**. Column 2 is the same as column 1, save for the deduction of direct earnings at the OCC campuses themselves – the broad taxpayer perspective is conservative in the sense that it includes only off-campus earnings as part of public benefits. Column 3 shows the single year state and local taxpayer cost, as reflected in state and local tax items in **Table 2.1**. Finally, Column 4 considers the broad perspective on the taxpayer's investment in a cash flow sense, subtracting annual costs from annual benefits.

The NPV given this broad perspective is $4,000 million and the B/C ratio is 13.4. More succinctly, every dollar of tax monies spent on OCC education will generate a total of $13.37 worth of social savings.[17]

[17]A word of caution – the RR approach sometimes generates percentage results that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. A very high percentage return may be technically correct, but perhaps not consistent with conventional understanding of returns expressed as percentages. For purposes of the reports prepared for all colleges in the statewide system, therefore, we express all RR results as: "NA" (particularly for the broad taxpayer perspective where high returns are expected). Only the B/C ratio is reported for the broad taxpayer perspective.

Table 3.7. Taxpayer Perspective: Broad ($ Thousands)

Year	1 All Benefits	2 Benefits from Alt. Ed. Opportunities	3 Net Benefits	4 Total Taxpayer Costs	5 Less CC Income Cash Flow
1	$709,606	$59,844	$649,762	$336,168	$313,594
2	$253,552	$59,555	$193,997	$0	$193,997
3	$308,914	$72,558	$236,356	$0	$236,356
4	$307,442	$72,212	$235,230	$0	$235,230
5	$305,978	$71,869	$234,110	$0	$234,110
6	$304,522	$71,526	$232,995	$0	$232,995
7	$303,072	$71,186	$231,886	$0	$231,886
8	$301,630	$70,847	$230,783	$0	$230,783
9	$300,195	$70,510	$229,685	$0	$229,685
10	$298,767	$70,175	$228,592	$0	$228,592
11	$297,346	$69,841	$227,505	$0	$227,505
12	$295,932	$69,509	$226,423	$0	$226,423
13	$294,525	$69,178	$225,346	$0	$225,346
14	$293,125	$68,850	$224,275	$0	$224,275
15	$291,732	$68,522	$223,210	$0	$223,210
16	$290,346	$68,197	$222,149	$0	$222,149
17	$288,967	$67,873	$221,094	$0	$221,094
18	$287,594	$67,551	$220,044	$0	$220,044
19	$286,229	$67,230	$218,999	$0	$218,999
20	$284,870	$66,911	$217,959	$0	$217,959
21	$283,517	$66,593	$216,925	$0	$216,925
22	$282,172	$66,277	$215,895	$0	$215,895
23	$280,833	$65,962	$214,871	$0	$214,871
24	$279,501	$65,650	$213,851	$0	$213,851
25	$278,175	$65,338	$212,837	$0	$212,837
26	$276,856	$65,028	$211,828	$0	$211,828
27	$275,543	$64,720	$210,823	$0	$210,823
28	$274,237	$64,413	$209,824	$0	$209,824
29	$272,938	$64,108	$208,830	$0	$208,830
30	$271,644	$63,804	$207,840	$0	$207,840
31	$270,357	$63,502	$206,855	$0	$206,855
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
NPV			$4,323,278	$323,238	$4,000,040
IRR					NA
B/C ratio					13.4
Payback (years)					NA

The Narrow Taxpayer Perspective

Table 3.8 provides an investment analysis of OCC from the narrow taxpayer perspective. Recall from **Chapter 2** that the narrow perspective considers only moneys that actually appear on the books of state and local governments: revenue items such as tax receipts, and expenditures items such as road, bridge and street maintenance, police, public libraries and hospitals, jails and prisons, welfare payments, and so on.

BEST COPY AVAILABLE

Table 3.8, column 1 shows additions to state and local government revenues stemming from the operation of OCC during the single analysis year. The values in column 1 are computed by applying average state and local government tax rates to the net increase in regional income attributed to OCC.[18] Also included in column 1 are reductions (entered as negatives) in state and local government expenditures on crime, welfare, unemployment and health. Projected dollar amounts in column 1 are thus the sum of additional taxes collected, plus associated tax dollars saved as a result of the education provided by OCC during the single analysis year.

Column 2 is simply the state and local government expenditure in support of OCC for the analysis year, a value obtained directly from **Table 2.1**. Finally, column 3 subtracts state and local government cost (column 2) from benefits (column 1), thereby providing the temporal cash flow needed for the investment analysis. As shown at the bottom of the table, OCC provides state and local government with an annual return of $323,238 million expressed as a net present value on its one-year investment. Alternatively, the one-year investment generates a RR of 17.2% and a B/C ratio of 2.3, both indicating that the investment is attractive. The payback period is 6.7 years.

The returns shown in **Table 3.8** would be attractive even in the private sector, and they are very attractive in the public sector. Recall that the public sector generally undertakes those activities the private sector finds unprofitable, i.e., investments that generate book revenues insufficient to cover book costs, thus requiring taxpayer subsidy. For example, state governments fund the operation and maintenance of state parks at a substantial loss, collecting revenues in the form of camping and entrance fees that cover only a fraction of costs. Taxpayers are willing to subsidize parks because they perceive off-budget benefits, e.g., access to the outdoors, local development effects, environmental protection, and so on, that justify the budgetary losses. Note that this broader collection of off-budget benefits would normally be captured in the broad taxpayer perspective.

[18] Increased income includes a portion of direct student earnings, salaries and wages at the colleges during the single analysis year, and an additional increment aimed at a collection of backward and

Table 3.8 Taxpayer Perspective: Narrow ($ Thousands)

Year	1 Total Taxpayer Benefits	2 Benefits from Alt. Ed. Opportunities	3 Net Taxpayer Benefits	4 Total Taxpayer Costs	5 Net Cash Flow
1	$120,542	$8,444	$112,098	$336,168	($224,070)
2	$44,080	$10,353	$33,726	$0	$33,726
3	$53,357	$12,533	$40,825	$0	$40,825
4	$53,107	$12,474	$40,633	$0	$40,633
5	$52,858	$12,415	$40,442	$0	$40,442
6	$52,610	$12,357	$40,253	$0	$40,253
7	$52,363	$12,299	$40,064	$0	$40,064
8	$52,117	$12,241	$39,876	$0	$39,876
9	$51,873	$12,184	$39,689	$0	$39,689
10	$51,630	$12,127	$39,503	$0	$39,503
11	$51,387	$12,070	$39,317	$0	$39,317
12	$51,146	$12,013	$39,133	$0	$39,133
13	$50,907	$11,957	$38,950	$0	$38,950
14	$50,668	$11,901	$38,767	$0	$38,767
15	$50,430	$11,845	$38,585	$0	$38,585
16	$50,194	$11,790	$38,404	$0	$38,404
17	$49,959	$11,734	$38,224	$0	$38,224
18	$49,724	$11,679	$38,045	$0	$38,045
19	$49,491	$11,625	$37,867	$0	$37,867
20	$49,259	$11,570	$37,689	$0	$37,689
21	$49,029	$11,516	$37,513	$0	$37,513
22	$48,799	$11,462	$37,337	$0	$37,337
23	$48,570	$11,408	$37,162	$0	$37,162
24	$48,343	$11,355	$36,988	$0	$36,988
25	$48,116	$11,302	$36,815	$0	$36,815
26	$47,891	$11,249	$36,642	$0	$36,642
27	$47,667	$11,196	$36,471	$0	$36,471
28	$47,443	$11,144	$36,300	$0	$36,300
29	$47,221	$11,091	$36,130	$0	$36,130
30	$47,000	$11,039	$35,961	$0	$35,961
31	$46,780	$10,988	$35,792	$0	$35,792
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0
NPV			$747,257	$323,238	$424,018
IRR					17.2%
B/C ratio					2.3
Payback (years)					6.7

Investments in public education are usually viewed in the same way as investments in parks and other publicly subsidized activities, i.e., activities that generate losses from a narrow investment perspective but are justified by net benefits from a broad investment perspective. As shown in **Table 3.8**, however, OCC is a notable exception to this general net-subsidy rule. The

forward multiplier effects.

BEST COPY AVAILABLE

narrow perspective rate of return is strongly positive, and thereby indicates that the taxpayers' investments in the college generate increased public revenues, and reduced expenditures, that actually exceed the subsidy by taxpayers, i.e., the inflows (plus reduced outflows) exceed actual outflows. **The practical effect of this is the following: If the investments made in OCC were reduced, taxes would have to be raised in order for state and local governments to continue their support of other activities at current levels. Because OCC's operations generate the kinds of direct returns it does, the taxpayer investments of 58% of the total revenues in Table 2.1, in effect, subsidize other sectors of the economy that also receive taxpayer support. The simple bottom line from the narrow taxpayer perspective is that benefits accruing to the taxpayers far outweigh the relatively low investments they make in OCC.**

Summary

A summary of the investment analysis results (also reported in **Tables 3.6 – 3.8** above) is provided in **Table 3.9**, on aggregate, per CHE, and per student bases.

Table 3.9. Benefit - Cost Summary

	Aggregate	Per Credit	Per Student
PV of student benefits, increased earnings	$ 5,830,000,000	$1,498	$ 14,851
Health benefits, captured by society			
PV of absenteeism savings	$ 247,000,540	$63	$ 629
PV of tobacco and alcohol abuse medical savings	$ 364,254,506	$94	$ 928
Crime			
PV of reduced incarceration	$ 164,282,142	$42	$ 418
PV of reduced victim costs	$ 34,500,944	$9	$ 88
PV of earnings (opportunity gained)	$ 62,125,781	$16	$ 158
Unemployment and welfare			
PV of reduced welfare rolls	$ 4,033,938	$1	$ 10
PV of reduced unemployment	$ 131,980,038	$34	$ 336
Sum of all present values, benefits	$ 6,838,177,888	$ 1,757	$ 17,420
PV of all costs			
PV of state and local contribution to college budget	$ 336,167,859	$86	$ 1,959
PV of opportunity cost of education + tuition	$ 1,558,496,000	$401	$ 3,243
Sum of all present values, costs	$ 1,894,663,859	$ 487	$ 5,202
NPV, Student Perspective		$4,331,778	
RR, Student Perspective		24%	
B/C Ratio, Student Perspective		3.9	
Payback Period, Student Perspective		5.3	
NPV, Taxpayer Perspective: Broad		$4,000,040	
RR, Taxpayer Perspective: Broad		NA	
B/C Ratio, Taxpayer Perspective: Broad		13.4	
Payback Period, Taxpayer Perspective: Broad		NA	
NPV, Taxpayer Perspective: Narrow		$424,018	
RR, Taxpayer Perspective: Narrow		17.2%	
B/C Ratio, Taxpayer Perspective: Narrow		2.3	
Payback Period, Taxpayer Perspective: Narrow		6.7	

BEST COPY AVAILABLE

Figure 3.3. Investment Analysis: Present Value of Benefits

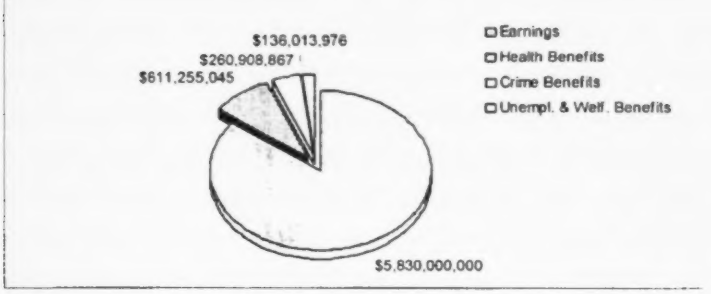
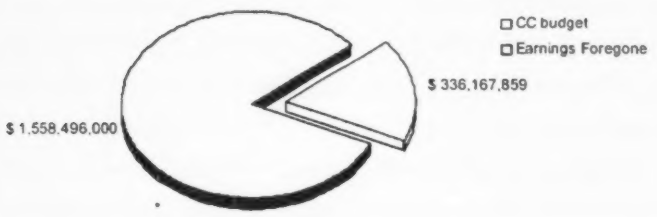


Figure 3.4. Investment Analysis: Present Value of Costs



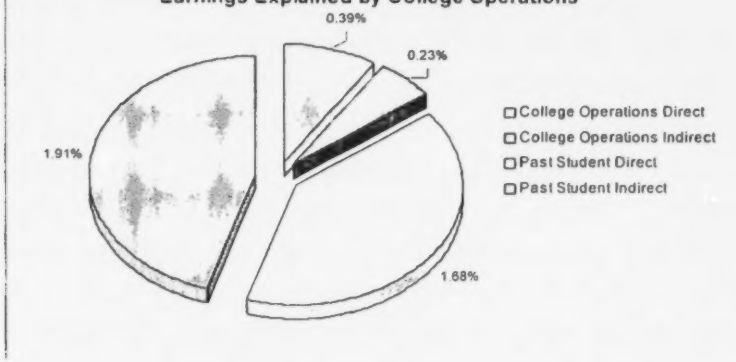
STATEWIDE ECONOMIC BENEFITS

The Oregon Community College System plays an important role in the health, growth and development of the state economy. This section estimates that role and expresses it as a gross share of statewide earnings. As indicated in **Table 3.10**, statewide earnings amount to $73,319,989 million (Regional Information System, U.S. Department of Commerce).

Table 3.10. Summary of College Role in the Regional Economy

	Earnings ($Thousands)	% of Total
Total Earnings in College-Hosting Region	$73,319,989	100%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$285,245	0.4%
Indirect Earnings	$169,577	0.2%
TOTAL	$454,823	0.6%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$1,228,210	1.7%
Indirect Earnings	$1,397,551	1.9%
TOTAL	$2,625,761	3.6%
GRAND TOTAL	$3,080,584	4.2%

Figure 3.5. College Role in Regional Economy, % of All Earnings Explained by College Operations



OCC Operations

As shown in **Table 3.10**, the direct earnings of faculty and staff are equal to $285.2 million per year, and thus account for 0.4% of statewide earnings. Multiplier effects, from the spending of faculty and staff salaries and from OCC's purchase of goods and services, account for another $169.6 million, or 0.2% of earnings. Altogether, OCC operations directly or indirectly account for $454,823 million per year, or 0.6% of all earnings generated in the state.

Past Student Economic Development Effects

Past students provide skills that attract new industry and make existing industry more competitive and productive. Accounting for retirement, out-

migration and death, we estimate that the current Oregon Community College System workforce embodies 58.0 million CHEs of past instruction (see **Table 2.12**). As shown in **Table 3.10**, these directly account for $1,228.2 million, or 1.7% of statewide earnings.

Associated with the increased earnings of past OCC students is a collection of *demand-induced* and *agglomeration-induced* indirect effects. As shown in **Table 3.10**, these indirect effects account for $1,397.6 million, or 1.9% of statewide earnings.

Total Economic Benefits

Finally, the overall role of OCC in the state economy is equal to the sum of the direct and indirect effects. Accordingly, the college accounts for $3,080.6 million, or 4.2% of all earnings.

Chapter 4
SENSITIVITY ANALYSIS OF KEY VARIABLES

INTRODUCTION

We conclude this study with a **base case** sensitivity analysis of some key variables on both the investment and regional economic development sides. The purpose of the sensitivity analysis is to set our approach apart from "advocacy" education impact analyses. Many of these may lack uniformity and use assumptions that will not stand up to rigorous peer scrutiny, and often generate results that grossly overstate benefits. The approach taken here is to account for all relevant variables on both the benefit and cost sides as reflected in the conservatively estimated base case assumptions laid out in **Chapter 2**.

INVESTMENT ANALYSIS: THE STUDENT PERSPECTIVE

The variables tested relate to the earnings foregone by the students – the opportunity cost of time. They include: 1) the % of the students employed, and 2) of those employed, the earnings received relative to the full earnings they would have received if not attending the OCC. These affect the investment analysis manifested in the results (NPV, RR, B/C, and payback period).

Percent of Students Employed

The students incur substantial expense by attending the OCC because of time spent not gainfully employed. Some of that cost is recaptured if the student remains partially (or fully) employed while attending college. It is estimated that an overall average of 69% of the current student body in the state is employed. In the sensitivity analysis this variable is tested as we change the assumption to 100%. The revised assumption would mean that *all* of the students are employed, thus the average opportunity cost of time would be reduced accordingly.

Percent of Earnings Relative to Full Earnings

The second opportunity cost variable is more difficult to estimate. For the OCC it is estimated that, of the students working while attending classes, their earnings amounted to only 61%, on average, relative to earnings they would have statistically received if not attending the CCs. This suggests that many of the students hold part-time jobs earning minimum wage (or less than their "statistical" wages). The model captures these differences and counts them as a part of the opportunity cost of time. In the sensitivity analysis this variable also is tested by changing the assumption to 100%. As above, this would mean that the students are fully employed, and the average opportunity cost of time would be reduced accordingly.

RESULTS

The changed results are summarized in **Table 4.1**. Here, the base case assumptions are reflected in the two shaded rows for the variables tested – 69% for the portion of students employed, and 61% for their earnings relative to the statistical averages, taken from **Table 2.2**. These (base case) assumptions are held constant in the shaded rows for the student perspective. The sensitivity analysis results are shown in the non-shaded rows – the extent to which the investment analysis results would change if the two base case variables were increased to 100%, first separately, and second, together. Changing both assumptions to 100% (all students fully employed) would automatically increase the benefits because the opportunity cost of time would reduce to zero.

1. Increasing the students employed assumption from 69% to 100% first (holding all of the other assumptions constant), the RR, B/C, and payback period results would improve to 35.2%, 5.4, and 3.9 years, respectively, relative to the base case results. The improved results are attributable to a lower opportunity cost of time – all students would be employed in this case.

2. Increasing the earnings relative to the statistical averages from 61% to 100% second (holding the second employment assumption constant at the base case level), the RR, B/C, and payback period results would improve to

49.3%, 7.1, and 3.1 years, respectively, relative to the base case results—a strong improvement over the base case results, again attributable to a lower opportunity cost of time.

3. Finally, increasing both of the above assumptions to 100% simultaneously, the RR, B/C, and payback period results would improve yet further to >100%, 45.5, and 1.4 years, respectively, relative to the base case results. This scenario assumes that all students are fully employed and earning full salaries (equal to the statistical averages) while attending classes. These results are unrealistic, albeit not uncommon for advocacy analyses.

Table 4.1 Sensitivity Analysis of Student Perspective

Variables	Assumptions	RR	B/C	Payback
1. Percent	69%	23.9%	3.9	5.3
Employed	100%	35.2%	5.4	3.9
2. Percent of	61%	23.9%	3.9	5.3
Earnings	100%	49.3%	7.1	3.1
1 = 100%, 2 = 100%		>100%	45.5	1.4

A final note to this student perspective sensitivity analysis—we strongly emphasize that the results, given the assumptions, are very attractive—the results are all well above their threshold levels and the payback periods are short. As clearly demonstrated here, advocacy results **appear** much more attractive, although they would overstate the benefits. The results presented in **Chapter 3** are **realistic**, indicating that investments in the OCC will generate excellent returns, well above the long-term average percent rates of return in the stock and bond markets of roughly 7%.

STATEWIDE ECONOMIC DEVELOPMENT

We estimated the economic impacts of the OCC in **Chapter 3, Table 3.10** based on college operations and capital spending, and the increased productivity effects of past OCC students in the workforce. The impacts were expressed in terms of earnings, i.e., wages, salaries and proprietors' income,

BEST COPY AVAILABLE

published by the U.S. Department of Commerce.[19] In the present section we address two issues that occasionally arise in college economic impact studies: 1) the addition of **student spending** effects to impact estimates, and 2) the expression of economic impacts in terms of **gross sales** rather than earnings.

The Economic Impact of Student Spending

Students spend money while attending college: they buy books and supplies, rent rooms, purchase food, pay for transportation, attend sports events and go to movies, and so on. These expenditures create jobs and incomes for local businesses, which, as argued by some, should be counted among the economic impacts attributable to the colleges.

In **Table 3.10**, however, we exclude student spending because most of the students already reside in-state. Student expenditures, therefore, do not represent **new** monies, but rather a redirection of monies that would have been spent anyway. The other side of the argument is that, even though the college-related spending of a resident student does not constitute new money, absent the colleges, some students will leave the state to obtain an education elsewhere. Thus, the state loses the spending and related jobs and incomes. Both cases have merit, although we believe the former more so than the latter. This is because only a few students will actually be able to avail themselves of education elsewhere (see **Table 2.9**). Our approach, therefore, is to exclude student spending, recognizing at the same time, that the statewide impact estimates may err on the conservative side.

In **Table 4.2** we show the potential magnitude of student spending effects in the state economy. The table parallels **Table 3.10** in the previous chapter, but adds the section "Earnings Attributable to Student Spending,"[20] creating

[19] U.S. Department of Commerce, Regional Economic Information System (REIS) data include earnings estimates for counties and states, and are published annually in the *Department's Survey of Current Business*. They are also readily available in electronic form.

[20] We estimated student spending effects by borrowing average college student information from a study conducted for higher education economic impacts in Illinois (University of Illinois, 2000). Student spending by broad expenditure category was bridged to the sectors of the OCC regional economy input-output model. Adjustments were made consistent with the model's accounts to allow for spending leakages.

some $803.5 million in additional earnings for the in-state businesses patronized by students (the direct effects), plus another $372.9 million in earnings stemming from related multiplier effects (indirect effects). Adding the student spending to the mix increases the OCC total "explanatory power" of earnings from 4.2% in **Table 3.10** to 5.8% in **Table 4.2**.

Table 4.2. Summary of College Role in the Regional Economy

	Earnings ($ Thousands)	% of Total
Total Earnings in College-Hosting Region	$73,319,989	100%
Earnings Attributable to Student Spending		
Direct Earnings	$803,481	1.1%
Indirect Earnings	$372,887	0.5%
TOTAL	$1,176,368	1.6%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$285,245	0.4%
Indirect Earnings	$169,577	0.2%
TOTAL	$454,823	0.6%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$1,228,210	1.7%
Indirect Earnings	$1,397,551	1.9%
TOTAL	$2,625,761	3.6%
GRAND TOTAL	$4,256,952	5.8%

Economic Impacts Reported as Gross Sales

Advocates sometimes favor gross sales over earnings as an impact measure, because sales are always larger than earnings. But gross sales used as an impact measure has notable drawbacks. An immediate drawback is that, unlike earnings, there is generally no published total against which a sales impact can be measured. More importantly though, the most troublesome aspect of gross sales impact measures is captured in the following example:

> Two visitors spend $50,000 each. One visits an auto dealer and purchases a new luxury automobile. The other enters the county hospital for a medical procedure. In terms of direct economic impact, both have spent $50,000. However, the expenditures will likely have very different meanings to the state economy. Of the $50,000 spent for the luxury automobile, perhaps $9,000 remains in-state as salesperson commissions and auto dealer income (part of the overall earnings), while the other $41,000 leaves the state for Detroit or somewhere else as wholesale payment for the new automobile. Contrast this to the hospital expenditure. Here perhaps $40,000 appears as physician, nurse, and assorted

BEST COPY AVAILABLE

hospital employee wages (part of the county's overall earnings), while only $10,000 leaves the state, to pay for hospital supplies, or to help amortize building and equipment loans. In terms of sales, both have the same impact, while in terms of earnings, the former has less than one-fourth the impact of the latter.

Table 4.3 expresses the OCC impacts in terms of gross sales rather than earnings. Note that gross sales measures are everywhere larger than earnings. The economy-wide measure of total gross sales estimated by the economic model is $205.8 billion.[21] Direct local spending by students reflects their total spending, reduced by the estimated portion that leaks out-of-state to purchase goods produced elsewhere.[22] In the usual fashion, indirect effects reflect the action of local economic multiplier effects, also estimated by the economic model.

Direct expenditures include all spending by the college for consumer items and faculty and staff salaries. Both items are reduced to reflect purchases from outside the state. All told, the operation of the OCC is estimated to explain some $10,147.6 million in gross sales, a number roughly twice the $4,257.0 million explained by the colleges in gross earnings shown in **Table 4.2**.

[21] Simply stated, economy-wide gross sales are obtained by multiplying sector-specific earnings by a national estimate of sales-to-earnings.

[22] Students purchase gasoline for their cars, for example, and while the trade margin stays in-state, in most cases the producer price of gasoline itself will leak out to the oil producing region.

Table 4.3. Summary of CCs Role in the State Economy

	Gross Sales (1,000)	% of Total
Total Gross Sales	$205,759,926	100%
Gross Sales Attributable to Student Spending		
Direct Spending by Students	$1,442,378	0.7%
Indirect Spending Effect	$930,703	0.5%
TOTAL	$2,373,082	1.2%
Gross Sales Attributable to College Operations		
Direct Expenditures of CC	$235,376	0.1%
Indirect Spending Effect	$222,401	0.1%
TOTAL	$457,777	0.2%
Gross Sales Attributable to Past Student Econ. Dev. Effects		
Direct Gross Sales	$3,456,982	1.7%
Indirect Gross Sales	$3,859,717	1.9%
TOTAL	$7,316,699	3.6%
GRAND TOTAL	$10,147,558	4.9%

While the gross sales impacts shown in **Table 4.3** are not incorrect, we prefer to report college impacts in terms of earnings in **Table 3.10** rather than gross sales because they reflect the economic realities in the state much more so than the sales numbers. Advocacy studies, on the other hand, will often opt to express the results in terms of sales because the numbers are much more impressive. Such results, however, will likely not stand up to peer scrutiny in the economics profession.

BEST COPY AVAILABLE

REFERENCES

Bils, M. and P.J. Klenow, 2000. Does Schooling Cause Growth? American Economic Review, 90(5), 1160-1183.

Bonczar, Thomas P. and Alan J. Beck, 1997. Lifetime Likelihood of Going to State or Federal Prison. US Department of Justice, Office of Justice Programs, March 1997.

Borts, G. H., and J. L. Stein, 1964. Economic Growth in a Free Market. NY: Columbia University Press.

Cato Institute; Policy Analysis 240, 1995. Authors: Michael Tanner, Stephen Moore, and David Hartman. The Work Versus Welfare Tradeoff, An Analysis of Total Welfare Benefits by State.

Centers for Disease Control and Prevention; National Center for Health Statistics, Health, United States, 2001, Table 61.

The Center for Health Statistics, Health Promotion and Disease Questionnaire of the 1990 National Health Interview Survey.

Christaller, 1966; Central Places in Southern Germany (C.W. Baskins, trans.). Englewood Cliffs, N.J., Prentice Hall.

Christophersen, Kjell A., and H. Robison, 2000. The Socioeconomic Benefits of Community Colleges, Illustrated with Case Studies of Everett Community College and Walla Walla Community College in Washington State. Volume 1: Summary Report. EMSI, Consulting Economists.

Drake, R. L. 1976. A Shortcut to Estimates of Regional Input - Output Multipliers: Methodology and Evaluation. International Regional Science Review, Vol. 1, No. 2, Fall 1976.

Grubb, Norton, CCRC Brief No. 2, ICCN 15-26-2049, June 1999.

Heritage Foundation, Means-Tested Welfare Spending: Past and Future Growth, Testimony by Robert Rector, (3/07/01), http://www.heritage.org/library/testimony/test080101.html.

Losch, 1954. The Economics of Location (W.H. Woglom and W.F. Stolper, trans.). New Haven: Yale University Press.

Miller, R.E. and P. Blair. 1985. Input-Output Analysis: Foundations and Extensions. Englwood Cliffs, NJ: Prentice Hall.

Molitor, Chris and D. Leigh. March 2001. Estimating the Returns to Schooling: Calculating the Difference Between Correlation and Causation. Discussion Paper prepared for CCbenefits, Inc.

National Center for Education Statistics, The Digest of Education Statistics: 2000, 1990 K Street, NW, Washington, DC 20006, USA, Phone: (202) 502-7300, http://nces.ed.gov/pubs2001/digest/list_figures.html.

National Center for Education Statistics, Literacy Behind Walls, Prison Literacy Programs, DIGEST No. 159 Literacy in Corrections, Correctional Educational Association, http://www.nifl.gov/newworld/correct.htm.

National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, http://www.nida.nih.gov/EconomicCosts/Index.html

Parr, J.B. 1999. "Regional Economic Development: An Export-Stages Framework." Land Economics, 77(1): 94-114.

Robison, M.H. 1997. "Community Input-Output Models for Rural Area Analysis: with an Example from Central Idaho," Annals of Regional Science, 31(3), 325-351.

Stevens, B.H., G.I. Treyz, D.J. Ehrlich, and J.R. Bower, 1983. "A New Technique for the Construction of Non-Survey Regional Input-Output Models," International Regional Science Review, 8(3), 271-186.

University of Illinois, Institute of Government and Public Affairs, 2000. Illinois Higher Education: Building the Economy, Shaping Society. Illinois Board of Hugher Education.

US Census Bureau, Current Population Survey, 2000.

US Dept. of Commerce, Regional Economic Information Systems, Zip Code Business Patterns, 1998.

US Dept. of Commerce, US Bureau of the Census, 1998. Money Income of the United States 1998, Current Population Reports, Household and Economic Statistics Division.

U.S. Department Of Health And Human Services,Centers for Disease Control and Prevention, National Center for Health Statistics, Division of Data Services, Hyattsville, MD, 20782-2003, (301) 458-4636, http://www.cdc.gov/nchs/.

US Dept. of Commerce, County Business Patterns, annual.

US Dept. of Commerce, Regional Economic Information System, county data on CD ROM, annual.

US Department of Commerce Statistical Abstract, 1997-1999.

The National Clearinghouse for Alcohol and Drug Information 11426 Rockville Pike, Suite 200, Rockville, Maryland, http://www.health.org/govstudy/bkd265/Index.htm

National Institute on Alcohol Abuse and Alcoholism (NIAAA) 6000 Executive Boulevard - Willco Building Bethesda, Maryland 20892-7003, http://www.niaaa.nih.gov/

Bureau of Justice Statistics, Table #. 05 Total direct and intergovernmental expenditure, by activity and level of government, fiscal years 1980-97, Criminal Justice Expenditure and Employment Extracts Program, 12/14/00.

US Department of Labor, Bureau of Labor Statistics, Office of Employment and Unemployment, 2000.

US Department of Labor, The Public Purpose: U.S. Employee Absences by Industry, 2000.

U.S. Department of Treasury, The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation http://www.ustreas.gov/press/releases/docs/tobacco.pdf.

Appendix 1: Explaining the Results—a Primer

The purpose of this appendix is to provide some context and meaning to investment analysis results in general, using the simple hypothetical example summarized in **Table 1** below. The table shows the projected (assumed) benefits and costs over time for one student and the associated investment analysis results.

Table 1. Costs and Benefits

	Tuition	Opportunity Cost	Total cost	Higher Earnings	NCF
1	$1,500	$20,000	$21,500	$0	($21,500)
2	$0	$0	$0	$5,000	$5,000
3	$0	$0	$0	$5,000	$5,000
4	$0	$0	$0	$5,000	$5,000
5	$0	$0	$0	$5,000	$5,000
6	$0	$0	$0	$5,000	$5,000
7	$0	$0	$0	$5,000	$5,000
8	$0	$0	$0	$5,000	$5,000
9	$0	$0	$0	$5,000	$5,000
10	$0	$0	$0	$5,000	$5,000
NPV			$20,673	$35,747	$15,074
IRR					18%
B/C ratio					1.7
Payback period					4.2 years

The assumptions are as follows:

1) The time horizon is 10 years—i.e., we project the benefits and costs out 10 years into the future (column 1). Once the higher education has been earned, the benefits of higher earnings remain with the student into the future. Our objective is to measure these future benefits and compare them to the costs of the education.

2) The student attends the CC for one year for which he or she pays a tuition of $1,500 (column 2).

BEST COPY AVAILABLE

3) The opportunity cost of time (the earnings foregone while attending the CC for one year) for this student is estimated at $20,000 (column 3).

4) Together, these two cost elements ($21,500 total) represent the out-of-pocket investment made by the student (column 4).

5) In return, we assume that the student, having completed the one year of study, will earn $5,000 more per year than without the education (column 5).

6) Finally, the net cash flow column (NCF) in column 6 shows higher earnings (column 5) less the total cost (column 4).

7) We assume a "going rate" of interest of 4%, the rate of return from alternative investment schemes, for the use of the $21,500.

Now the "mechanics" – we express the results in standard investment analysis terms: the net present value (NPV), the internal rate of return (IRR – or, as referred to in the main report, simply the rate of return – RR), the benefit/cost ratio (B/C), and the payback period. Each of these is briefly explained below in the context of the cash flow numbers in **Table 1**.

THE NET PRESENT VALUE (NPV)

"A bird in hand is worth two in the bush." This simple folk wisdom lies at the heart of any economic analysis of investments lasting more than one year. The student we are tracking in **Table 1** has choices: a) to attend the CC, or b) forget about higher education and hold on to the present employment. If he or she decides to enroll, certain economic implications unfold: the tuition must be paid and earnings will cease for one year. In exchange, the student calculates that, with the higher education, his or her income will increase by at least the $5,000 per year as indicated in the table.

The question is simple: will the prospective student be economically better off by choosing to enroll? If we add up the higher earnings of $5,000 per year

for the remaining nine years in **Table 1**, the total will be $45,000. Compared to a total investment of $21,500, this appears to be a very solid investment. The reality, however, is different – the benefits are far lower than $45,000 because future money is worth less than present money. The costs (tuition plus foregone earnings) are felt immediately because they are incurred today – in the present. The benefits (higher earnings), on the other hand, occur in the future. They are not yet available. We must discount all future benefits by the going rate of interest (referred to as the discount rate) to be able to express them in present value terms.[23] A brief example: at 4%, the present value of $5,000 to be received one year from today is $4,807. If the $5,000 were to be received in year 10, the present value would reduce to $3,377. Or put another way, $4,807 deposited in the bank today earning 4% interest will grow to $5,000 in one year; and $3,377 deposited today would grow to $5,000 in 10 years. An "economically rational" person would, therefore, be equally satisfied receiving $3,377 today or $5,000 10 years from today given the going rate of interest of 4%. The process of discounting – finding the present value of future higher earnings – allows us express values on an equal basis in future or present value terms.

Our goal is to express all future higher earnings in present value terms so that we can compare them to the investments incurred today – the tuition and foregone earnings. As indicated in **Table 1**, the cumulative present value of the flow of $5,000 worth of higher earnings between years 2 and 10 is $35,747 given the 4% interest rate, far lower than the undiscounted $45,000 discussed above.

The measure we are looking for is the NPV result of $15,074. It is simply the present value of the benefits less the present value of the costs, or $35,747 - $20,673 = $15,074. In other words, the present value of benefits exceeds the present value of costs by as much as $15,074. The criterion for an economically worthwhile investment is that the NPV is equal to or greater

[23] Technically, the **interest rate** is applied to compounding – the process of looking at deposits today and determining how much they will be worth in the future. The same interest rate is called a **discount rate** when we reverse the process – determining the present value of future earnings.

than zero. Given this result, it can be concluded that, *in this case*, and given these assumptions, this particular investment in CC education is very strong.

THE INTERNAL RATE OF RETURN (IRR)

The IRR is another way of measuring the worth of the investment in education using the same cash flows shown in **Table 1**. In technical terms—the IRR is a measure of the average earning power of the money used over the life of the investment. It is simply the interest rate that makes the NPV equal to zero. In the NPV example above we applied the "going rate" of interest of 4% and computed a positive NPV of $15,074. The question now is: what would the interest rate have to be in order to reduce the NPV to zero? Obviously it would have to be higher—18% in fact, as indicated in **Table 1**. Or, if we applied 18% to the NPV calculations instead of the 4%, then the NPV would reduce to zero.

What does this mean? The IRR of 18% defines a breakeven solution—the point where the present value of benefits just equals the present value of costs, or where the NPV equals zero. Or, at 18%, the higher incomes of $5,000 per year for the next 9 years will earn back all the investments of $21,500 made plus pay 18% for the use of that money (the $21,500) in the meantime. Is this a good return? Indeed it is—first, if we compare it to the 4% "going rate" of interest we applied to the NPV calculations, 18% is far higher than 4%. We can conclude, therefore, that the investment in this case is solid. Alternatively, we can compare the rate to the long-term 7% rate or so obtained from investments in stocks and bonds. Again, the 18% is far higher, indicating that the investment in CC education is strong relative to the stock market returns (on average).

A word of caution—the IRR approach can sometimes generate "wild" or "unbelievable" results—percentages that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. For example, if the student works full time while attending college, the opportunity cost of time would be much lower—the only out-of-pocket cost would be the $1,500

paid for tuition. In this case, it is still possible to compute the IRR, but it would be a staggering 333% because only a negative $1,500 cash flow will be offsetting 9 subsequent years of $5,000 worth of higher earnings. The 333% return is technically correct, but not consistent with conventional understanding of returns expressed as percentages. For purposes of this report, therefore, we express all results in the main report exceeding 100% simply as: "> than 100%."

The Benefit/Cost Ratio (B/C)

The B/C ratio is simply the present value of benefits divided by present value of costs, or $35,747 / $21,500 = 1.7 (based on the 4% discount rate). Of course, any change in the discount rate will also change the B/C ratio. If we applied the 18% IRR discussed above, the B/C ratio would reduce to 1.0—or the breakeven solution where benefits just equal the costs. Applying a discount rate higher than the 18 percent would reduce the ratio to less than one and the investment would not be feasible. The 1.7 ratio means that a dollar invested today will return a **cumulative** $1.70 over the 10-year time period.

The Payback Period

This is the length of time from the beginning of the investment (consisting of the tuition plus the earnings foregone) before the higher future earnings return the investments made. In **Table 1**, it will take roughly 4.2 years of $5,000 worth of higher earnings to recapture the student's investment of $1,500 in tuition and the $20,000 earnings he or she foregoes while attending the CC. The higher earnings occurring *beyond* the 4.2 years are the returns (the "gravy") that make the investment in education *in this example*, economically worthwhile. The payback period is a fairly rough, albeit common, means of choosing between investments. The shorter the payback period, the stronger the investment.

Appendix 2: Methodology for Creating Income Gains by Levels of Education

The US Bureau of the Census reports income in two ways:

1) Mean income by race and Hispanic origin and by sex.

2) Educational attainment by mean income and sex.

The first and second data sets can be found at the following sources:

U.S. Census Bureau and U.S. Department of Commerce. Table P-3: Race and Hispanic Origin of People by Mean Income and Sex: 1947 to 2000, and Table P-18: Educational Attainment--People 25 Years Old and Over by Mean Income and Sex: 1991 to 2000. Also consult:

http://www.census.gov/ftp/pub/hhes/income/histinc/histinctb.html

Further contact information: a) Income Surveys Branch, b) Housing & Household Economic Statistics Division, c) U.S. Census Bureau, and d) U.S. Department of Commerce.

The data needed for this analysis is mean income by educational attainment reported by race/ethnic origin and by sex. A model was developed to translate these two data sets into the data needed for the analysis. This was accomplished in the following way:

1. Mean income by race and sex are calculated as a percent of all races.

2. This percent is then applied to mean income by educational attainment. For example, African-American males make an average income of $28,392 versus $40,293 for all males, or 70% of the average income of all males.

3. This percent (70%) is then applied to the income levels by educational attainment for all males to estimate the income levels by educational attainment for African-American males.

4. To simplify the analysis, all nonwhite males are averaged together as are all nonwhite females. The same process is repeated for white males and white females.

5. The educational levels of attainment are aggregated together in some categories to model the educational system of community colleges. These numbers are then adjusted for inflation to 2001 dollars.

6. The final step is to adjust these income levels by state. The *Four Person Median Family Income by State* from the Bureau of the Census was used to make state level adjustments. Each state's median family income is taken as a percentage of the national average. These percentages are then applied to the income levels by educational attainment by race, ethnicity and sex calculated earlier.

The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon

Volume 2: Detailed Results

by

Entry Level of Education

Gender and Ethnicity

15-Mar-2002

Kjell A. Christophersen & M. Henry Robison

CCBenefits Inc.

email: ccb@turbonet.com

BEST COPY AVAILABLE

INTRODUCTION

The purpose of this volume is to present the results of the economic impact analysis in detail, by gender, ethnicity and entry level of education. It is kept as a separate volume intended for limited distribution only, however, because this effort is not about gender and ethnicity differences *per se*. The study is about the overall economic impacts generated by community colleges (CCs). As such, the Main Report and the short Executive Summary both present the results without reference to gender and ethnicity differences.

We feel, nevertheless, that it is important to present *all* of the results for the sake of completeness, not just the consolidated ones, so long as the users of the detailed information remain prudent in its use and distribution. The results should not be used, for example, to further political agendas. Other studies about gender and ethnicity differences address such questions better and in greater detail. Our intent is simply to provide CC presidents with pertinent information should specific questions arise.

On the input side, gender and ethnicity are important variables that help characterize the student body profile. We collect the profile data and link it to national statistical databases which themselves are also broken out by gender and ethnic differences. The student body profile, to a large extent, drives the magnitudes of the results as presented in detail in this volume and in a consolidated fashion in the Main Report and the Executive Summary.

Tables 19 and **20** in this report are particularly important. They provide the data needed for computing the investment analysis results in **Tables 3.7** and **3.8** in the **Main Report** – the broad and narrow taxpayer perspectives. In **Table 19**, every other column (the higher taxes and the avoided cost columns) provides the data needed for the narrow taxpayer perspective. The remaining columns provide the data needed for the broad taxpayer perspective. **Table 20** provides the detailed calculations on student earnings that feed into the first column of **Table 19**.

DETAILED RESULTS

Table 1. Higher Annual Earnings Based on Achievements During Analaysis Year, Aggregate

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	$12,034,614	$2,994,225	$8,241,566	$2,174,694	$25,445,099
HS/GED equivalent	$14,479,945	$3,602,626	$10,007,438	$2,640,653	$30,730,662
1 year post HS or less	$54,651,187	$7,057,974	$39,555,625	$5,620,182	$106,884,967
2 years post HS or less	$56,381,762	$7,816,971	$41,814,006	$6,564,596	$112,577,334
> Associate Degree	$33,137,529	$4,104,886	$26,019,605	$3,605,341	$66,867,360
Total	$170,685,037	$25,576,682	$125,638,239	$20,605,465	$342,505,423

Table 2. No. of Days Reduced Absenteeism/Year

	Male		Female		Reduce
	White	Minority	White	Minority	Absent.
< HS/GED	4,217	1,871	6,682	3,970	16,741
HS/GED equivalent	3,493	1,550	5,535	3,289	13,866
1 year post HS or less	6,852	3,325	11,430	7,559	29,167
2 years post HS or less	2,265	1,116	3,843	2,712	9,937
> Associate Degree	19,247	3,860	23,926	6,426	53,459
Total	36,075	11,722	51,416	23,956	123,170

Table 3. Employer Savings from Reduced Absenteeism, $ per Year

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	$395,034	$108,245	$321,969	$153,546	$978,794
HS/GED equivalent	$503,224	$137,891	$423,651	$202,038	$1,266,803
1 year post HS or less	$1,141,461	$342,101	$1,019,906	$541,366	$3,044,834
2 years post HS or less	$442,138	$134,566	$405,231	$229,563	$1,211,499
> Associate Degree	$4,266,202	$528,473	$2,883,510	$621,517	$8,299,702
Total	$6,748,059	$1,251,275	$5,054,268	$1,748,030	$14,801,633

Table 4. Fewer Smokers

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	67	53	40	35	195
HS/GED equivalent	56	44	33	29	161
1 year post HS or less	661	153	757	114	1,685
2 years post HS or less	478	115	557	91	1,241
> Associate Degree	660	65	365	74	1,164
Total	1,922	430	1,751	343	4,446

Table 5. Medical Savings from Reduced Smoking, $ per Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$198,890	$156,095	$117,029	$104,433	$576,448
HS/GED equivalent	$164,739	$129,293	$96,935	$86,502	$477,468
1 year post HS or less	$1,958,516	$453,217	$2,243,083	$336,695	$4,991,510
2 years post HS or less	$1,416,982	$341,788	$1,648,774	$269,015	$3,676,558
> Associate Degree	$1,955,152	$192,502	$1,080,218	$220,398	$3,448,270
Total	$5,694,278	$1,272,895	$5,186,038	$1,017,043	$13,170,254

Table 6. Fewer Alcohol Abusers

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	12	5	14	5	35
HS/GED equivalent	10	4	12	4	29
1 year post HS or less	217	47	139	25	428
2 years post HS or less	157	35	102	10	304
> Associate Degree	100	40	138	48	326
Total	495	131	405	91	1,122

Table 7. Medical Savings from Reduced Alcohol Abuse, $/Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$91,975	$37,051	$112,105	$36,856	$277,987
HS/GED equivalent	$76,183	$30,689	$92,856	$30,528	$230,255
1 year post HS or less	$1,722,321	$371,745	$1,105,945	$199,206	$3,399,217
2 years post HS or less	$1,246,096	$280,347	$812,923	$79,817	$2,419,182
> Associate Degree	$794,554	$318,719	$1,097,474	$378,940	$2,589,688
Total	$3,931,130	$1,038,551	$3,221,302	$725,347	$8,916,330

Table 8. Fewer Incarcerated, Aggregate for Student Body

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	93.5	20.0	1.5	3.3	118.2
HS/GED equivalent	77.4	16.5	1.2	2.7	97.9
1 year post HS or less	365.6	287.7	4.6	51.4	709.4
2 years post HS or less	1.1	24.8	0.2	7.4	33.6
> Associate Degree	31.3	23.8	1.4	9.5	66.0
Total	569	373	9	74	1,025

Table 9. Savings from Reduced Incarceration, $ per Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$908,165	$194,098	$14,367	$31,964	$1,148,594
HS/GED equivalent	$752,228	$160,770	$11,900	$26,476	$951,374
1 year post HS or less	$3,553,353	$2,796,169	$45,090	$499,552	$6,894,164
2 years post HS or less	$10,907	$241,356	$2,385	$71,559	$326,207
> Associate Degree	$303,838	$230,855	$13,526	$92,695	$640,914
Total	$5,528,490	$3,623,249	$87,269	$722,245	$9,961,253

Table 10. Crime Victim Savings, Aggregate for Student Body, $/Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$190,724	$40,763	$3,017	$6,713	$241,217
HS/GED equivalent	$157,976	$33,763	$2,499	$5,560	$199,798
1 year post HS or less	$746,241	$587,224	$9,469	$104,911	$1,447,846
2 years post HS or less	$2,290	$50,687	$501	$15,028	$68,507
> Associate Degree	$63,809	$48,482	$2,841	$19,467	$134,599
Total	$1,161,040	$760,920	$18,327	$151,679	$2,091,966

Table 11. Productivity Gained (Fewer Incarcerated), $ per Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$313,109	$41,331	$2,579	$4,606	$361,625
HS/GED equivalent	$341,882	$45,129	$2,874	$5,131	$395,016
1 year post HS or less	$1,769,851	$860,177	$11,994	$106,653	$2,748,676
2 years post HS or less	$6,303	$86,151	$742	$17,875	$111,072
> Associate Degree	$199,770	$93,746	$4,821	$26,519	$324,856
Total	$2,630,915	$1,126,535	$23,011	$160,784	$3,941,245

Table 12. Fewer People on Welfare

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	1	2	4	93	100
HS/GED equivalent	0	2	3	69	74
1 year post HS or less	2	4	13	186	205
2 years post HS or less	0	0	0	6	7
> Associate Degree	0	0	0	33	34
Total	3	8	20	388	420

Table 13. Community Welfare Saving, $ per Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$2,654	$10,452	$17,720	$17,720	$48,546
HS/GED equivalent	$1,964	$7,734	$13,113	$13,113	$35,924
1 year post HS or less	$8,936	$19,527	$62,780	$62,780	$154,023
2 years post HS or less	$279	$614	$1,995	$1,995	$4,882
> Associate Degree	$0	$1,223	$0	$0	$1,223
Total	$13,834	$39,550	$95,607	$95,607	$244,598

Table 14. Fewer People on Unemployment

	Male		Female		
	White	Minority	White	Minority	Total
< HS/GED	44	33	69	41	188
HS/GED equivalent	37	27	57	34	155
1 year post HS or less	72	58	118	79	327
2 years post HS or less	24	19	40	28	111
> Associate Degree	29	2	49	6	85
Total	206	139	332	188	866

Table 15. Unemployment Saving, $ per Year

	Annual Costs, Male		Annual Costs, Female		
	White	Minority	White	Minority	Total
< HS/GED	$429,956	$315,882	$667,347	$400,143	$1,813,329
HS/GED equivalent	$356,130	$261,643	$552,760	$331,437	$1,501,970
1 year post HS or less	$698,629	$561,393	$1,141,567	$761,852	$3,163,441
2 years post HS or less	$230,971	$188,479	$383,762	$273,337	$1,076,550
> Associate Degree	$277,731	$15,558	$469,674	$54,531	$817,495
Total	$1,993,417	$1,342,956	$3,215,111	$1,821,300	$8,372,784

Table 16. Summary of Annual Impacts, $ per Year

	Male		Female		
	White	Minority	White	Minority	Total
Higher earnings	$170,685,037	$25,576,682	$125,638,239	$20,605,465	$342,505,423
Absenteeism Savings	$6,748,059	$1,251,275	$5,054,268	$1,748,030	$14,801,633
Medical Cost Savings	$9,625,408	$2,311,446	$8,407,341	$1,742,389	$22,086,584
Incarceration Savings	$5,528,490	$3,623,249	$87,269	$722,245	$9,961,253
Crime Victim Savings	$1,161,040	$760,920	$18,327	$151,679	$2,091,966
Add Prod. (fewer incarc.)	$2,630,915	$1,126,535	$23,011	$160,784	$3,941,245
Welfare Savings	$13,834	$39,550	$95,607	$95,607	$244,598
Unemployment Savings	$1,993,417	$1,342,956	$3,215,111	$1,821,300	$8,372,784
Total	$198,386,200	$36,032,613	$142,539,172	$27,047,500	$404,005,486

Table 17. Annual Impacts per Credit Hour Equivalent, $ per Year

	Male		Female		Weighted
	White	Minority	White	Minority	Average
Higher earnings	$ 127	$ 84	$ 71	$ 61	$ 88
Absenteeism Savings	$ 5	$ 4	$ 3	$ 5	$ 5
Medical Cost Savings	$ 7	$ 8	$ 5	$ 5	$ 6
Incarceration Savings	$ 4	$ 12	$ 0	$ 2	$ 9
Crime Victim Savings	$ 1	$ 3	$ 0	$ 0	$ 2
Add Prod. (fewer incarc.)	$ 2	$ 4	$ 0	$ 0	$ 3
Welfare Savings	$ 0	$ 0	$ 0	$ 0	$ 0
Unemployment Savings	$ 1	$ 4	$ 2	$ 5	$ 4
Total	$ 148	$ 119	$ 81	$ 80	$ 117

Table 18. Annual Impacts per Student, $ per Year

	Male		Female		Weighted
	White	Minority	White	Minority	Average
Higher earnings	$ 1,212	$ 805	$ 681	$ 583	$ 890
Absenteeism Savings	$ 48	$ 39	$ 27	$ 49	$ 43
Medical Cost Savings	$ 68	$ 73	$ 46	$ 49	$ 61
Incarceration Savings	$ 39	$ 114	$ 0	$ 20	$ 86
Crime Victim Savings	$ 8	$ 24	$ 0	$ 4	$ 18
Add Prod. (fewer incarc.)	$ 19	$ 35	$ 0	$ 5	$ 28
Welfare Savings	$ 0	$ 1	$ 1	$ 3	$ 2
Unemployment Savings	$ 14	$ 42	$ 17	$ 52	$ 39
Total	$ 1,409	$ 1,134	$ 772	$ 766	$ 1,168

Table 19 Cumulative Impact Over Time ($'000), Details for Both Taxpayer Perspectives

			Health				Crime						Welfare / Unemployment			
Year	Earnings Net	Added Taxes	Reduced Absent.	Avoided Cost	Medical Saving	Avoided Cost	Incarc-eration	Avoided Cost	Victims	Avoided Cost	Product. Gained	Avoided Cost	Reduced Welfare	Avoided Cost	Reduced Unempl.	Avoided Cost
1	$648,108	$108,657	$14,802	$1,891	$22,087	$1,325	$9,961	$7,969	$2,092	$0	$3,941	$661	$245	$39	$8,373	$0
2	$192,421	$32,260	$14,736	$1,883	$21,988	$1,318	$9,907	$7,925	$2,081	$0	$3,904	$655	$243	$39	$8,294	$0
3	$248,151	$41,603	$14,670	$1,874	$21,846	$1,311	$9,853	$7,882	$2,069	$0	$3,867	$648	$242	$39	$8,216	$0
4	$247,045	$41,418	$14,605	$1,866	$21,726	$1,304	$9,799	$7,839	$2,058	$0	$3,831	$642	$241	$38	$8,139	$0
5	$245,944	$41,233	$14,539	$1,858	$21,607	$1,296	$9,745	$7,796	$2,047	$0	$3,795	$636	$239	$38	$8,062	$0
6	$244,847	$41,049	$14,475	$1,849	$21,489	$1,289	$9,692	$7,753	$2,035	$0	$3,759	$630	$238	$38	$7,986	$0
7	$243,756	$40,866	$14,410	$1,841	$21,372	$1,282	$9,639	$7,711	$2,024	$0	$3,724	$624	$237	$38	$7,911	$0
8	$242,669	$40,684	$14,346	$1,833	$21,255	$1,275	$9,586	$7,669	$2,013	$0	$3,689	$618	$235	$38	$7,837	$0
9	$241,587	$40,503	$14,282	$1,825	$21,138	$1,268	$9,534	$7,627	$2,002	$0	$3,654	$613	$234	$37	$7,763	$0
10	$240,511	$40,322	$14,218	$1,817	$21,023	$1,261	$9,481	$7,585	$1,991	$0	$3,620	$607	$233	$37	$7,690	$0
11	$239,438	$40,142	$14,155	$1,809	$20,908	$1,254	$9,430	$7,544	$1,980	$0	$3,586	$601	$232	$37	$7,617	$0
12	$238,371	$39,963	$14,092	$1,801	$20,793	$1,248	$9,378	$7,502	$1,969	$0	$3,552	$595	$230	$37	$7,546	$0
13	$237,309	$39,785	$14,029	$1,792	$20,680	$1,241	$9,327	$7,461	$1,959	$0	$3,519	$590	$229	$37	$7,475	$0
14	$236,251	$39,608	$13,966	$1,785	$20,567	$1,234	$9,276	$7,421	$1,948	$0	$3,485	$584	$228	$36	$7,404	$0
15	$235,198	$39,431	$13,904	$1,777	$20,454	$1,227	$9,225	$7,380	$1,937	$0	$3,453	$579	$227	$36	$7,335	$0
16	$234,149	$39,256	$13,842	$1,769	$20,342	$1,221	$9,175	$7,340	$1,927	$0	$3,420	$573	$225	$36	$7,266	$0
17	$233,105	$39,081	$13,781	$1,761	$20,231	$1,214	$9,124	$7,299	$1,916	$0	$3,388	$568	$224	$36	$7,197	$0
18	$232,066	$38,906	$13,719	$1,753	$20,120	$1,207	$9,074	$7,260	$1,906	$0	$3,356	$563	$223	$36	$7,130	$0
19	$231,032	$38,733	$13,658	$1,745	$20,010	$1,201	$9,025	$7,220	$1,895	$0	$3,324	$557	$222	$35	$7,062	$0
20	$230,002	$38,560	$13,597	$1,737	$19,901	$1,194	$8,975	$7,180	$1,885	$0	$3,293	$552	$220	$35	$6,996	$0
21	$228,977	$38,388	$13,536	$1,730	$19,792	$1,188	$8,926	$7,141	$1,875	$0	$3,262	$547	$219	$35	$6,930	$0
22	$227,956	$38,217	$13,476	$1,722	$19,684	$1,181	$8,877	$7,102	$1,864	$0	$3,231	$542	$218	$35	$6,865	$0
23	$226,940	$38,047	$13,416	$1,714	$19,576	$1,175	$8,829	$7,063	$1,854	$0	$3,201	$537	$217	$35	$6,800	$0
24	$225,928	$37,877	$13,356	$1,707	$19,469	$1,168	$8,781	$7,025	$1,844	$0	$3,171	$532	$216	$34	$6,736	$0
25	$224,921	$37,709	$13,297	$1,699	$19,362	$1,162	$8,733	$6,986	$1,834	$0	$3,141	$527	$214	$34	$6,673	$0
26	$223,918	$37,540	$13,237	$1,691	$19,256	$1,155	$8,685	$6,948	$1,824	$0	$3,112	$522	$213	$34	$6,610	$0
27	$222,920	$37,373	$13,178	$1,684	$19,151	$1,149	$8,637	$6,910	$1,814	$0	$3,082	$517	$212	$34	$6,548	$0
28	$221,927	$37,207	$13,120	$1,676	$19,046	$1,143	$8,590	$6,872	$1,804	$0	$3,053	$512	$211	$34	$6,486	$0
29	$220,937	$37,041	$13,061	$1,669	$18,942	$1,137	$8,543	$6,834	$1,794	$0	$3,025	$507	$210	$34	$6,425	$0
30	$219,953	$36,876	$13,003	$1,661	$18,839	$1,130	$8,496	$6,797	$1,784	$0	$2,996	$502	$209	$33	$6,365	$0
31	$218,972	$36,711	$12,945	$1,654	$18,736	$1,124	$8,450	$6,760	$1,775	$0	$2,968	$498	$207	$33	$6,305	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PV	$4,508,035	$755,783	$247,001	$31,559	$364,255	$21,855	$164,282	$131,426	$34,501	$0	$62,126	$10,416	$4,034	$645	$131,980	$0

BEST COPY AVAILABLE

Table 20. Earnings Calculations, Taxpayer Perspectives ($'000)

Year	Gross Student Earnings	Net of Attrition	Direct Earnings Net	Indirect Student Earnings	Net Total Student Earnings	Total CC Earnings	Total Earnings Net
1	$273,966	$273,966	$90,409	$102,874	$193,283	$454,823	$648,106
2	$275,336	$272,745	$90,006	$102,416	$192,421	$0	$192,421
3	$358,453	$351,738	$116,074	$132,077	$248,151	$0	$248,151
4	$360,245	$350,170	$115,556	$131,489	$247,045	$0	$247,045
5	$362,046	$348,609	$115,041	$130,902	$245,944	$0	$245,944
6	$363,857	$347,055	$114,528	$130,319	$244,847	$0	$244,847
7	$365,676	$345,508	$114,018	$129,738	$243,756	$0	$243,756
8	$367,504	$343,968	$113,509	$129,160	$242,669	$0	$242,669
9	$369,342	$342,435	$113,004	$128,584	$241,587	$0	$241,587
10	$371,189	$340,908	$112,500	$128,011	$240,511	$0	$240,511
11	$373,045	$339,389	$111,998	$127,440	$239,438	$0	$239,438
12	$374,910	$337,876	$111,499	$126,872	$238,371	$0	$238,371
13	$376,784	$336,370	$111,002	$126,307	$237,309	$0	$237,309
14	$378,668	$334,870	$110,507	$125,743	$236,251	$0	$236,251
15	$380,562	$333,378	$110,015	$125,183	$235,198	$0	$235,198
16	$382,464	$331,892	$109,524	$124,625	$234,149	$0	$234,149
17	$384,377	$330,412	$109,036	$124,069	$233,105	$0	$233,105
18	$386,299	$328,939	$108,550	$123,516	$232,066	$0	$232,066
19	$388,230	$327,473	$108,066	$122,966	$231,032	$0	$231,032
20	$390,171	$326,013	$107,584	$122,418	$230,002	$0	$230,002
21	$392,122	$324,560	$107,105	$121,872	$228,977	$0	$228,977
22	$394,083	$323,113	$106,627	$121,329	$227,956	$0	$227,956
23	$396,053	$321,673	$106,152	$120,788	$226,940	$0	$226,940
24	$398,033	$320,239	$105,679	$120,249	$225,928	$0	$225,928
25	$400,024	$318,811	$105,208	$119,713	$224,921	$0	$224,921
26	$402,024	$317,390	$104,739	$119,180	$223,918	$0	$223,918
27	$404,034	$315,975	$104,272	$118,648	$222,920	$0	$222,920
28	$406,054	$314,567	$103,807	$118,120	$221,927	$0	$221,927
29	$408,084	$313,165	$103,344	$117,593	$220,937	$0	$220,937
30	$410,125	$311,769	$102,884	$117,069	$219,953	$0	$219,953
31	$412,175	$310,379	$102,425	$116,547	$218,972	$0	$218,972
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0

BEST COPY AVAILABLE

The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon

State of Oregon

Executive Summary

14-Mar-2002

(revised 25-Mar-2002)

Kjell A. Christophersen & M. Henry Robison

CCBenefits Inc.

email: cchbi@urbanet.com

BEST COPY AVAILABLE

Executive Summary

HIGHLIGHTS

- Oregon's Community Colleges pay $285.2 million in direct faculty and staff wages and salaries, and explain an additional $2,795 million in wages and salaries off campus.
- Taxpayers see a real money "book" return on their annual investments in Oregon's Community Colleges of 17% and recover all investments in 6.7 years.
- Students enjoy an attractive 24% annual return on their investment of time and money – for every $1 the student invests in OCCS, he or she will receive a cumulative $3.89 in higher future earnings over the next 30 years.
- The State of Oregon benefits from improved health and reduced welfare, unemployment, and crime, saving the public some $61.5 million per year.

INTRODUCTION

How does the State of Oregon economy benefit from the presence of Oregon's Community Colleges (OCCs)? An obvious question often asked, but rarely answered with more than anecdotes. The State of Oregon Department of Community Colleges and Workforce Development (DCCWD) contracted with CCbenefits, Inc. to apply a comprehensive economic model they have developed to capture and quantify the economic and social benefits of community colleges (CCs). The model took over a year to develop with funding from the Association for Community College Trustees (ACCT), it relies on data collected from individual CCs, and translates these into common sense benefit-cost and investment terms. It has been subjected to peer review, field tested on over 50 different CCs throughout the nation, and now applied to OCCs. Model results are based on solid economic theory, carefully drawn functional relationships, and a wealth of national and local education-related data. The model provides relief from the all-too-common "advocacy analyses" that inflate benefits, understate costs, and thus discredit the process of higher education impact assessment.

Four types of benefits are tracked: (1) contributions to local job and income formation (regional economic benefits); (2) higher earnings captured by exiting students; (3) a broad collection of social benefits (improved health, reduced crime, and lower welfare and unemployment); and (4) the return to taxpayers for their CC support.

THE RESULTS

For a more in depth exploration of the study, the reader is encouraged to consult the main report "The Socioeconomic Benefits Generated by 17 Community Colleges in Oregon" containing the detailed assumptions, their context, and the computation procedures.

➢ Statewide Perspective

The existence of OCCs explains $3,080.6 million of all annual earnings in the State

BEST COPY AVAILABLE

of Oregon economy (see map). The earnings explained by OCCs are equal to that of roughly 92,288 jobs. The earnings and job effects break down as follows:

*approx. economic regions serving as backdrop for eco. impact calculations; not necessarily district boundaries

- *Operations and Capital Spending*

The 17 colleges pay wages and salaries, which generate additional incomes as they are spent. Likewise, OCCs operating and capital expenditures generate still further earnings. Altogether, these earnings account for $454.8 million annually in the State of Oregon economy (equal to that of 13,626 jobs).

- *Higher Earnings due to Past Instruction*

Each year students leave the 17 colleges and join or rejoin the local workforce. Their added skills translate to higher earnings and a more robust economy. Based on current enrollment, turnover, and the growth of instruction over time, the workforce embodies an estimated 58.0 million credits of past instruction (credit and non-credit hours). The accumulated contribution of past OCCs instruction adds some $2,625.8 million in annual earnings to the State of Oregon economy (equal to that of 78,663 jobs).

➢ **Student Perspective**

The student's perspective on the benefits of higher education is the most obvious: he or she sacrifices tuition and current earnings for a lifetime of higher earnings. For every credit completed OCCs students will, on average, earn $88 more per year, every year they are in the workforce. Alternatively, for every full-time year they attend they will earn an additional $3,688 per year. In the aggregate (all exiting students), the higher earnings amount to some $342.5 million per year, every year they remain in the workforce.

From an investment standpoint, OCCs students will, on average, enjoy a 24% rate of return on their investments of time and money, which compares favorably with the returns on other investments, e.g., the long-term return on US stocks and bonds. The corresponding B/C ratio (the sum of the discounted future benefits divided by the sum of the discounted costs) is 3.9, i.e., for every $1

the student invests in OCCs education, he or she will receive a cumulative of $3.89 in higher future earnings over the next 30 years or so. The payback period (the time needed to recover all costs) is 5.3 years.

➢ **Taxpayer Perspectives**

State and local government spent $336,167,859 in support of OCCs during the analysis year. Is this a good use of taxpayer money? Our analysis indicates that the answer is a resounding yes: returns far outweigh the costs, particularly when a collection of social savings is included in the assessment. For example, persons with higher education are less likely to smoke or abuse alcohol, draw welfare or unemployment benefits, or commit crimes. This translates into associated dollar savings (avoided costs) amounting to some $29 per credit per year, counted as an indirect benefit of OCCs education. When aggregated across all exiting students, the State of Oregon will benefit from $61.5 million worth of avoided costs per year, broken down as follows:

- *Improved Health*

State of Oregon area employers will see health-related absenteeism decline by 123,170 days per year, with a corresponding annual dollar savings of $14.8 million. The state will benefit from the health-related savings of 4,446 fewer smokers and 1,122 fewer alcohol abusers. The corresponding dollar savings are $13,170,254 and $8,916,330 per year, now and into the future (these savings include insurance premiums, co-payments and deductibles, and withholding for Medicare and Medicaid).

- *Reduced Crime*

Studies show that incarceration drops with each year of higher education. In the State of Oregon, 1,025 fewer individuals will be incarcerated per year, resulting in annual savings of $9,961,253 (combined savings from reduced arrest, prosecution, jail, and reform costs). Reductions in victim costs (e.g., property damage, legal expenses, lost workdays, etc.) result in savings of $2,091,966 per year. Finally, people employed rather than incarcerated add $3,941,245 of earnings per year to the economy.

- *Reduced Welfare/Unemployment*

There will be 420 fewer people on welfare, and 866 fewer drawing unemployment benefits per year, respectively, saving some $244,598 and $8,372,784 per year in the state.

➢ **Taxpayer Return on Investment**

The return on a year's worth of state and local government investment in OCCs is obtained by projecting the associated educational benefits into the future, discounting them back to the present, and weighing these against the $336,167,859 state and local taxpayers spent during the analysis year to support the 17 colleges in the system. The analysis assumes that without the state and local government support (58% of the budgets on average) the 17 OCCs colleges would have to shut their doors. Two investment perspectives are possible, one broad and one narrow.

- *Broad Perspective*

Taxpayers expect their annual investment in OCCs to result in higher lifetime earnings for students and social savings

from lifestyle changes (reduced crime, welfare and unemployment, and improvements in health). From a broad investment perspective, the value of all future earnings and associated social savings is compared to the year's worth of state and local taxpayer support that made the benefits possible. Following this procedure, the B/C ratio generated for the whole system is 13.4, i.e., every dollar of state or local tax money invested in OCCS today returns a cumulative of $13 over the next 30 years.

- *Narrow Perspective*

The narrow perspective limits the benefit stream to state and local government budgets, namely increased tax collections and expenditure savings. For example, in place of total increased student earnings, the narrow perspective includes only the increased state and local tax receipts from those higher earnings. Similarly, in place of overall crime, welfare, unemployment and health savings, the narrow perspective includes only those portions that translate to actual reductions in state and local government expenditures.

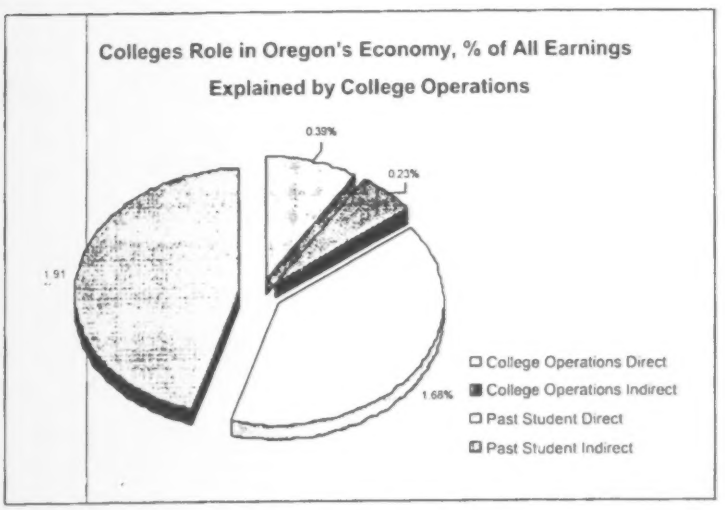
Note here that it is normal for the state government to undertake activities wanted by the public, which are unprofitable in the marketplace. This means that positive economic returns are generally not expected from government investments. From the narrow taxpayer perspective, therefore, even a small positive return (a B/C ratio equal to just greater than 1, and/or a rate of return equal to or just greater than the 4.0% discount rate used in this analysis) would be a most favorable outcome certainly one that justifies continued taxpayer support of the college. For OCCs, the narrow perspective results greatly exceed the minimum expectations. The results indicate strong and positive returns: a RR of 17%, a B/C ratio of 2.3 (every dollar of state or local tax money invested in OCCs today returns a cumulative $2.31 over the next 30 years), and a short payback period of only 6.7 years.

CONCLUSION

The results of this study demonstrate that the investment in the Oregon's Community Colleges is sound from a multiple of perspectives. It enriches the lives of students while reducing the demand for taxpayer-supported social services. Finally, it contributes to the vitality of both the local and state economies.

Benefits at a Glance

Statewide Analysis			Statewide Impact
Statewide Economic Development			
Increment from college operations			$454,823,000
Increment from past student productivity			$2,625,761,000
Total			$3,080,584,000
Job equivalent			92,288
Annual Benefits			
Higher earnings			
Aggregate (all student)			$342,505,423
Per Credit			$88
Per year full time equivalent student			$3,688
Social savings			
Aggregate (all students)			$61,500,062
Per Credit			$29
Per year full time equivalent student			$1,149
Investment Analysis	**RR**	**B/C Ratio**	**Payback (Years)**
Students	24%	3.9	5.3
Taxpayers: Broad Perspective	NA	13.4	NA
Taxpayers: Narrow Perspective	17%	2.3	6.7



In sum, the graph shows that the college explains a total of 4.2% of all earnings ($73.32 billion) generated from all sources in the state.

This short summary report is one of four products generated for this impact study. In addition, one long report intended for economists and CC institutional researchers (65 pp) lays out the detailed assumptions and analysis. Another report (10 pp) provides detailed tabular results by gender, ethnicity, and entry levels of education. Lastly, a PowerPoint presentation is developed showing the main results for CC Presidents to adapt and use in speeches before state legislators and other education stakeholders.

BEST COPY AVAILABLE

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

X	This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
	This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").